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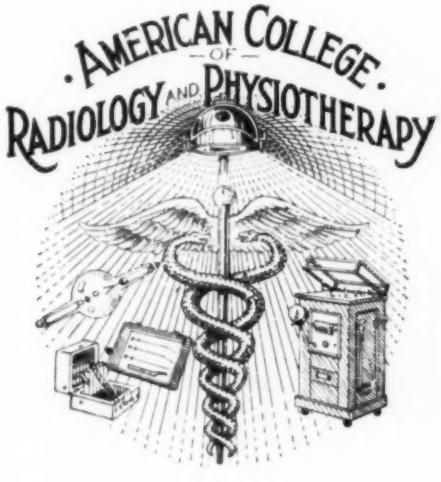

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Physiotherapy in Ulcers, Sinuses and Fistulas*

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THE rapid growth of physiotherapeutical measures in the field of so-called minor surgery does not depend entirely, as it did years ago, upon a limited modality for its therapeutic results. Fundamentally, the orthodox physician must lean upon diagnosis now as in years before. When the two are in co-ordination, the value of physical measures is greatly enhanced. Thus the successful treatment of ulcers, sinuses and fistulas depends upon the co-operation of all known therapeutic modalities and an accurate knowledge of the underlying pathology. It is quite obvious that the pathology of ulcerations and penetrating tracts originates from many heterogeneous sources. Briefly, the factors that comprise the etiology of ulcerations are:

1. Pyogenic: Caused by inflammation due to pyogenic cocci.
2. Traumatic: Due to injury from mechanical, chemical, thermal, or electrical sources.
3. Congestive: Due to reduced vitality because of deficient circulation and a concomitant traumitism and infection.
4. Necrotic: Due to loss of tissue by sloughing.
5. Trophic: Due chiefly to nerve lesions causing anesthesia.
6. Specific: Due to special bacterial diseases, such as tuberculosis, syphilis, anthrax.
7. Malignant: Due to pressure of the malignant growth, followed by the breaking down and ulceration of skin.

*Read at the Third Annual Meeting of the American College of Radiology and Physiotherapy, Chicago, Nov. 13, 1924.

One must keep in mind the points of difference between a sinus and a fistula. The former is a tract lined with granulation and pyogenic organisms leading from a free surface into the depths of the tissue. The latter is a hard, fibrous like tract which opens at both ends to an external or internal cutaneous or mucous surface. I shall limit this discussion to the tuberculosis and septic types.

The physician must have a knowledge of the causative factors as well as an adequate experience with the various modalities that can best relieve these conditions. The physiotherapist must not be limited to a single technique or to any one modality. Obviously, success is attained only when the application of the various modalities are combined.

In a critical review of the current literature, one is impressed with a view of skepticism concerning the various orthodox methods of treatment. The many forms of therapy advocated include surgical procedure, drugs, biologic therapy, etc., each of which gave no definite or specific results.

It is now the consensus of opinion that drug therapy alone, applied to accessible, indolent conditions, yields unsatisfactory results, because the underlying pathology is no indication for the drug in question. Topical applications are not penetrating; corrosive drugs produce unyielding scars that very often destroy the effect desired. Ointments produce merely superficial healing because of their sedative effects and their dielectric or insulating qualities. Those of us who have searched for more positive effects, have gradually yielded to the brilliant expositions of the modern French and German schools in which electrology was first developed as a powerful adjunct to scientific medicine.

Evolution of the Electrical Modalities.

The discovery of electricity dates back about twenty-five centuries ago when the Greek philosopher, Thales, of Miletus, speculated on the unusual phenomenon of a certain transparent, amber like substance. This he found to possess mysterious properties, for upon friction it attracted to itself various light articles; hence his assumption that it possessed a soul or electron. Pliny, the elder, also described this phenomenon, and believed, apparently, that the amber substance was rubbed into life by the action of his fingers. However, the germ of the great science lay hidden in mystery for many years. Its evolution was insidious, slow and intermittent. Centuries passed and the speculations of Thales lay dormant and neglected in the archives of the scholastic schools of the middle ages. The famous observations of Thales, however, were never lost. After a lapse of more than seventeen hundred years, Gilbert, of England rediscovered electricity, but unfortunately he clothed his findings in mysticism bordering close upon the occult. Hence his book, called De Magnetism, is worthy of mention merely as historical data in the evolution of electrology.

The discovery of galvanism hung upon a circumstance unusually slight and paradoxical. Madame Galvani was ill and her physician placed her on a diet of frogs' legs. Several of these animals rested upon an elec-

trical aparatus with which one of the assistants was experimenting at that time. Madame Galvani, casually observing the experiment, was terrified at the unusual phenomenon of the life like twitching of the dead frogs' legs. The now agitated patient reported her observations to Professor Lugi Galvani, her husband, who at that time was professor of anatomy at Bologna. The experiment was repeated with success, and the professor, who knew more of anatomy and less of electricity, believed that he was on the brink of the discovery of the secret of life. He entered with great ardor into his new research and observed that nerves and muscles were thrown into strange convulsions by contact with the two different metals. Thus, inexplicable fate gave to the world, through an anatomist not versed in electrical science, and the accidental observations of a bed-ridden woman, the important modality of galvanism.

Volta, professor of physics at Como, a contemporary of Galvani, saw the practical possibilities of Galvani's findings and definitely proved to the scientific world that this phenomenon was due to the polar effect of the metals upon the tissues.

Enthused by the possibilities of Volta's research, many physicists eventually entered the research field of galvanism and brought to light considerable important data which are today considered fundamental laws in physics and electrology. Briefly, it has been definitely proven that each pole of a galvanic current carried or produced definite reactive phenomena. It was found that the positive pole was an acid pole; that it was sedative in action; that it hardened tissues; that it had vasoconstrictor possibilities, and that metals and alkaloids were repelled by this pole, thus proving them to be electropositive in action.

On the other hand, it is observed that the negative pole was irritant in character; that it had liquifactive possibilities and softened tissues; that it removed scar tissues and dilated blood vessels; also that it was alkaline in reaction and repelled the salicylates and the halogen group, such as iodine and chlorine; thus proving these elements to be electronegative in reaction.

Careful investigation by many independent workers in the various branches of physics and medicine further brought to light the vast possibilities with which this current could be made use of. Clausius and Arrhenius, working on the problems of ionization, definitely disclosed the intimate associationship of the continuous current with ionic transports. Leduc and Quijano practically sum up the work of all previous experimenters in the field of clinical electrology. They proved that the greatest activity of the galvanic current takes place in the immediate vicinity of the poles, that ions of different elements have various rates of motion within the living tissue, that the hydrogen ion and the hydroxyl ion travel with greater speed within the human structure than any other ion, that the deposition of ions within the tissues is intracellular in nature and not intercellular, that inorganic elements, such as zinc, copper, mercury, etc., act as foreign bodies and thus various degrees of cellular and chemical changes take place following an ionic seance. Further, that adjacent tissue is stimulated to increased physiologic activity with a concomitant phagocytic and bactericidal potentiality. Local inflammation with the usual local acidosis is reduced to an alkaline, noninflammable condition with the negative pole, while the positive pole will reverse a condition of an opposite nature. The foregoing facts are as definite as any mathematical formula and demonstrable with the same degree of certitude. Indolent inflammatory parts can be activated and stimulated to a return to normal function by the polar and ionic effects of the continuous current.

In the surgical treatment of ulcers, sinuses and fistulas, both the direct electrolytic effects of the current and the action of the nascent products of this electrolysis are of great importance. For example, when a softening liquifactive end is desired upon scar tissue, whether topical in location or in the urethra, the application of the negative pole produces softening and fibrolytic changes that are definite and noticeable with each treatment. The process, in the main, is an electrolytic one, although it is true that caustic alkali is formed in the vicinity of the active or negative electrode and assists to some degree in the changing process. For instance, in septic sinuses, the positive polar effects of the continuous or direct current is brilliantly demonstrated. The technique is as follows: A zinc probe, or a zinc mercury probe, is passed into the sinus and attached to the positive pole. While a certain amount of electrolysis of the tissues takes place, the more important action is that of the nascent oxychloride of zinc, the product of the electrolysis. This produces both a destructive and antiseptic action on the lining membrane of the sinus.

Lupus nodules can be treated in the same manner by the application of a zinc needle with an approximate current of three to four ma. for about ten minutes. A point worth remembering in orificial electrolysis with the positive pole is to reverse the polarity shortly before removing the electrode. In this manner bleeding or adherence to the treated structure may be prevented.

Endocervicitis.

One feels justified to include in this paper the ionic treatment of endocervicitis, because this condition may be considered a form of infective sinusitis of the pelvic organs. Because of the very definite results obtained in endocervicitis with ionization a few points in the technique are well worth mentioning. However, before treatment is instituted, it is of much importance to rigidly exclude inflammatory conditions of the appendages, and especially such a state as extra-uterine pregnancy. With a large dispersing electrode on the abdomen, the positive zinc electrode is placed within the cervix to the internal os and held in place with proper packing. The milliamperage is very gradually brought up to the reading of 30 or 40 and held to this intensity for 10 to 20 minutes. If pain is complained of, the current is reduced until tolerable to the patient. The nascent oxychloride of zinc pervades the whole surface of the mucous membrane, permeating every crypt and follicle, destroying it more completely than by curettage, tamponage, or any other form of medication.

Fistula in Ano.

The ionization treatment of fistulae in the perineal region has been employed by many authorities with uniform success. The response to the foregoing treatment is fairly equal in the nontuberculous as well as in the tuberculous types. In the former, the combined employment of a zinc, or

zinc mercury probe, attached to the positive pole, the milliamperage proportionate to the size and length of the electrode, plus minute ionizing doses of x ray, has given the greatest of satisfaction. The small x ray dosage has a fibrolytic effect upon the walls of the fistula. By the softening effect, it helps in restoring the pathologic structure to a condition approaching the normal; while the purpose of the zinc ionization is a sterilization of the infected cavity and a stimulation of the cavity walls to a condition of healing. One should know whether the fistula is multi or monolocular. This is determined by gently introducing a dull probe and feeling in every direction. By bending the electrode before inserting, one can reach the various recesses without undue pain to the patient. The foregoing technique practically assures definite and uniform results.

In the tubercular type the addition of ultraviolet irradiation to the technique outlined is of importance. Clinicians have demonstrated the stimulating and oxidizing benefits of these rays. The hyperemia that follows actinic irradiation increases the blood supply as well as the nutrition to the affected part. In addition, general metabolism is activated to the point that the patient responds more favorably to the treatment. In the surgery of fistulae, the actinic ray is of immense value as a synergist when applied locally to the affected part and to the body in general. The following case may illustrate the effect of careless surgery in a fistula in ano:

> H. P., of Polish nationality, male, age 32, was transferred to the physiotherapy service, following an operation for an anal fistula. Drainage was apparently good; in a measure, the operation was a success. The patient responded to local and general actinic irradiation within a very short time. The wound closed and healed within six treatments. Shortly thereafter, however, the patient complained of distress and fulness in the perineal region. Examination yielded reinfective processes in the neighborhood of the old lesion. Closer inspection also disclosed a multilocular type of fistula, and, while surgical interference established drainage and evacuation from the main tract, reinfection took place through the many hidden and unevacuated crypts and recesses in which the knife had not penetrated. The actinic irradiation hastened the formation of granulation and closure of the wound ensued. It is more than probable that if surgical ionization had been employed, the entire multilocular path would have been closed at once. Then actinic irradiation would have provided oxidation and reduction.

Fistulae between the vaginal and rectal walls, usually due to inflammatory processes, manifest their existence by the passage of gaseous or fecal material from the rectum to the vagina. Very often a probe can be passed through the fistula or the combination of digital examination plus the probe may demonstrate its presence. Precede the ionization by a cleansing enema and an antiseptic douche, then follow by inserting the zinc probe through the vaginal wall into the entire fistulous tract up to the rectal end. The positive pole is attached to the zinc probe and a large dispersing pad rests under the lumbosacral portion of the patient. The milliamperage depends on the size of the probe and the seance lasts, on an average, for ten minutes. The discomfort following this technique is fairly negligible. The patient usually makes an uneventful recovery after a very few treatments. The entire procedure is within the boundaries of office treatment, and it eliminates tedious surgical and plastic operations.

Friel, in *Electric Ionization*, cites many ingenious techniques. I quote one which I have employed with much success. "In ionizing deep wounds," says Friel, "special attention has to be paid to the mechanical cleansing and the removal of all debris and clot, to the introduction of the ionizing fluid to the very bottom of the wound, so as to ensure contact of the fluid over the whole area of the wound cavity, and to the uniform distribution of the electric current over the entire surface. A case of a long sinus caused by a bullet which entered the outer side of the knee and traversed the thigh, emerging at the middle of the groin, which had suppurated for several weeks, was treated in the following manner: A Harrison's "urethral whip" was insinuated along the track, and where it emerged a piece of silk was tied to the end. This was drawn through the sinus, followed by a perforated rubber tubing containing a wire. A catheter was introduced as far as the middle of the thigh. This conducted a stream of 2 per cent zinc sulphate solution to the most distant part of the sinus—the middle—and the current was applied for half an hour. The wound was dressed the next day, when there was little discharge, and not again for ten days. It was then soundly healed."

Ionization places in our hands an offensive weapon against the agents of disease and attacks them, if possible, directly. Having convinced oneself of the reasonableness of the treatment, one may with energy and confidence assume the offensive. It has been our experience that treatment under an anesthetic in deep or painful wounds is likely to be more effective than when the patient can feel the manipulations necessary to discover the extent of the wound and the introduction of whatever tubes may be required.

Sinusitis With Osteomyelitis.

Certain types of septic sinusitis, such as that following an osteomyelitic involvement, is best combatted by a combination of daily diathermy by the plate method, followed or associated with twice or thrice weekly applications of actinic irradiation. Initially, in these types of cases, the removal of the sequestrum plus the establishment of proper drainage is of prime importance. With thermotherapy from diathermy we bring into action the value of conversive heat, the concomitant physiologic results of which is a reduction of pain due to the analgesic action on the nerve endings, a removal of toxins by the efferent blood and lymph stream, an increased local vascularity, and a softening of the parts due to an increased circulation. Moreover, the bactericidal effects of physiologic heat within the tissues has been discussed in recent literature. This tends to indicate that the lethal thermic dose for the bacteria is in no way detrimental to the treated structure. We have observed many cases that have come into our service with the poorest sort of prognosis get well under the combined therapy mentioned above. It is also surprising with what certainty function is re-estab-

lished, regardless of what the prognosis appeared to be at the outset.

Ulcers.

Foote, in discussing the orthodox treatment of varicose ulcers in minor surgery, sounds a pessimistic note. He says in part: "Some ulcers can be cured in a few weeks; in other cases months of the most faithful treatment must elapse before the epithelium can be coaxed over the granulating area. In these difficult cases a single ill chosen dressing, or a failure of the patient to come for treatments, or an alcoholic debauch, may wipe out the gain of weeks. Hence there are instances of patients who have come to be treated for an ulcer of the leg, more or less continuously for years."

In bygone years, those among us who have treated cases of indolent ulcers, whether in clinic or in private practice, without the use of physiotherapeutic measures, must tacitly re-echo the sentiments of Foote. We recall our personal experiences with unpleasant emotions, and it was often with a sense of relief when we found our clinic patients drifting to other doors.

Today, with the additional armament of ionization, surgical and medical diathermy, and the actinic ray, we have potent modalities that are tangible in therapy and definite in effect. The works of Leduc and Sir Lewis Jones contain many detailed expositions of the rapid healing of indolent ulcers, whether topical, diphtheritic or syphilitic in origin, by the zinc ions. Massey, the Dean of American Electrologists, has carried the burden and honor of enlightening the western world with the possibilities of cataphoresis.

Finzi, in the Proceedings of the Royal Society of Medizine, Vol. II, Page 140, experimented with the relative value of zinc and copper ionization in ulcers by placing half plates of each of the foregoing metals and found that the zinc end healed with greater rapidity. Leduc and Jones usually place a zinc plate the size and shape of the ulcer over the affected part, using a current of about 10 ma. for about 15 to 20 minutes. Improvement takes place practically with the first treatment and healing within a few weeks. Postoperatively, the ulcer is dressed with a mild unguent.

Our experience with the foregoing treatment has not been altogether favorable, for the patient usually complains of great discomfort and pain. For that reason, a painless technique is to be desired. Usually every case of ulcer, whether simply congestive or varicosed, has an associated oedema and swelling. If there are any predisposing factors, such as various constitutional disorders, these are duly considered and treatment administered according to the nature of the condition. The oedema and swelling is first diathermized by the cuff method over a period of treatments until improvement is apparent. Usually the swelling and pitting disappear within the first few treatments, and at the same time it is usually noticed that the ulcer takes on a healthier appearance. The ulcer itself, then, is treated in the following manner. It is first cleaned with hydrogen peroxide, and then an application of cotton soaked in a 10 per cent solution of cocain is applied to the ulcer with the anode as the active pole. The cathode soaked in ordinary water or in a 2 per cent saline solution is applied to the buttocks of the same limb. A current strength of 10 ma. is maintained for about ten minutes or to the point when complete anesthesia has occurred. The same pledget of cotton is now squeezed until it is fairly dry and then dipped in a solution of 2 per cent zinc sulphate and replaced over the entire ulcer, and a current applied the strength of which should be within the limits of tolerance of the patient—usually about 10 ma.—until the ulcer has assumed a pale or blanched appearance. Within a few days the ulcer turns to a dry dark brown or black appearance and within the period of a week the crust can be removed or it may be dressed with sterile petrolatum until it separates from the underlying structure, leaving a smooth, healthy cicatrix. In the interim, we again follow with diathermy to increase local circulation and to allay any possible pain or discomfort.

PUNCHED OUT ULCER.

Endarteritis obliterans, affecting usually the anterior and posterior tibial arteries, is caused by either a diabetic or luetic diathesis or follows traumatic or indifferent surgery to the lower limbs. It manifests itself symptomatically by a constant nagging pain, coldness, numbness, and gangrene of the large toe or punched out ulcers in the tarsometatarsal region. Pathologically, it consists of a proliferation of the cells of the tunica intima. The new layer of cells is vascularized from the vasa vasorum, with a slight thickening of the tunica media and some thickening of the advetitia. Heretofore, this condition was treated constitutionally and expectantly with indifferent results.

Antiluetic medication, or antidiabetic diet, should be given in connection with daily diathermic treatments. Here, again, the conversive heat of diathermy allays the constant pain, while nutrition and function is increased by the additional vascularity to the part. The diathermy technique used in the foregoing types of cases is a combination of knee and ankle cuff electrodes—the milliamperage in proportion to the active electrode—thirty minute duration. Where the toe or heel is involved, we advocate the cuff and water method. Because of the tenderness and extreme pain to the affected parts, the patient very often is unable to, or resists, diathermy treatment. In such cases we have found it expedient to place the patient upon a table, face down, with the feet projecting beyond the table. The endarteritic toe or heel is immersed in a weak salt solution and diathermy is given very cautiously and with the greatest of sedativeness. These treatments, as the patient improves, can gradually be prolonged up to an hour, if necessary.

TUBERCULOUS ULCERS.

The lymphatic glands of the neck are very often subject to chronic inflammatory processes of a tuberculous nature. This condition can be demonstrated at times by the presence of the tubercle bacilli in the discharging wound or by the examination of the excised gland. At other times, while the bacilli may not be demonstrable, the symptoms of anemia, anorexia, cold feet and hands, with the blood picture of an increased mononuclear and lymphocytic count is fairly pathognomonic of tuberculous lymphadenitis. While the treatment heretofore has been the combination of proper hygiene and surgical interference, the ungainly scars plus the long chronicity following surgical intervention has forced the profession to look for other means to circumvent the foregoing malady. Ultraviolet irradiation is fairly specific in

these types of cases. The affected part is cleansed with boric acid solution and oily parts properly removed by ether or chloroform, because they interfere with the absorptive qualities of the actinic rays. Local treatment with the water cooled lamp together with constitutional treatment by the air cooled lamp is the method of choice. Very often a topical application of a 2 per cent mercurochrome over the ulcerated area hastens granulation and repair. No single technique is applicable for all types of cases, since each case is usually an individual problem. Recoveries by the foregoing method are rapid, and the unsightly scars are thus reduced to a minimum.

EPITHELIOMAS OR RODENT ULCERS.

An epithelioma may develop in any portion of the epithelium covering of the head or lining of its cavities, and it is most frequently found in the region of the mucocutaneous junctions of the eyes, ears, nose and mouth. The predisposing factors, like that of malignant neoplasms in any other part of the body, is sometimes due to chronic irritations, or to close proximity of wounds of long duration. Warts or moles, which have remained stationary for many years, may suddenly begin to enlarge, and unless removed, develop the characteristic features of malignancy.

The rodent ulcer, or sebaceous carcinoma, has its starting point in the cells of the sebaceous glands. It begins as a nodule on the skin and breaks down, or ulcerates after several years, slowly destroying all adjacent tissue such as the eyeball, nose, or bones of the face. These types of ulcers show little heaping up, are covered by a scab, seldom or ever heal, never affect lymph glands or disseminate. Microscopically, it contains no prickle cells like an epithelioma and it never has cell nests or any keratinization. Moreover, its cells are smaller than an epithelioma.

The conservative surgeon usually employs the scalpel for early excision, x ray, radium, and the serum therapy. In very early types and in the so called precancerous stage, a questionable nomenclature, the foregoing method has some value. However, in the face of more recent work on malignant ulcerations, it has been demonstrated that the excision method predisposes or carries grave possibilities of reinfecting the patient with the malignant cells elsewhere, for is obvious that an open blood and lymph stream as produced by incision tends to colonize distal structures with the same growth. Thus the surgeon, searching for more specific technique, has adopted the employment of the high frequency current with the coagulation or desiccation method. Its utility is ideally demonstrated in accessible neoplasms, whether malignant or benign. Coagulation depends upon a D'Arsonval current of high amperage and relatively low voltage, while the desiccation depends upon an Oudin current of very high voltage and relatively low amperage. Electrocoagulation is a bipolar technique with the active electrode in intimate contact with the ulcer or neoplasm and a metered D'Arsonval current to measure the necessary amperage. Desiccation is a monopolar application which does not require a metered reading, because it is dependent upon a negligible amount of heat, hence an extremely low amperage.

In coagulation, the destructive or surgical effect is obtained by high amperage converted into destructive heat within the neighborhood of the button like or needle point electrode. The intense heat coagulates the protoplasmic or cellular structures, literally cooking the tissues within the vicinity of the active pole. On the other hand, the desiccating effect of the monopolar current leaves the treated tissues in a devitalized, dehydrated state, microscopically resembling a state of dry gangrene or mummification.

The small accessible malignant neoplasms of the basal or squamous cell type yield very readily to desiccation. Under local anesthesia, an epithelioma of the face is brushed or sparked over with an ordinary sewing needle attached to a suitable handle and a foot switch. The growth becomes dry, hard and horny in texture, in the space of a few minutes. After the lesion has healed, it is advisable to follow with a prophylactic dose of x ray. The cosmetic effect is excellent as no scarification follows the dehydration method.

In the more advanced accessible malignancies, such as epithelioma of the mouth, tongue, or body, coagulation offers the best results where complete destruction or amputation is desired. The procedure is the same as in any other major operation. The etherization of the patient is preceded by an injection of ¼ gr. morph. and 1/100 gr. hyosine, one and one-half hours and again three-quarters of an hour prior to operation. Ether or chloroform inhalation is given up to the time of the actual operation, but when ether is employed it must be stopped prior to the application of the electric current because of the danger of explosion. Important blood vessels should be tied off before coagulation takes place within their vicinity so as to prevent secondary hemorrhage, a condition which may occur between the tenth to the twenty-second day following the operation.

What then are the advantages with this technique? If the knife can accomplish the same results and as expeditiously, why, the surgeon will ask, shall we trouble ourselves with a new and expensive technique? Points of advantage as demonstrated by the experience of those familiar with this technique are:

1. Immediate destruction of the neoplastic cells *in situ*.

2. The carrying of the heat, by the current, to a depth in the tissue beyond that actually treated, thus assuring the destruction of any malignant cells which have been lying beyond the area which actually appear to have been involved—a selective action, as it were.

3. The practical elimination of either primary or secondary hemorrhage, as the blood vessels are thrombosed beyond the area of destruction.

4. For the same reason there is less risk of spread of metastatic elements through either the blood or lymph channels.

5. The minimum formation of contractile connective tissue is obtained.

6. Alleviation of pain; practically no surgical shock; accuracy of dosage, because the current is under absolute control of the operator; and the sterilization of wound incidental to treatment—all indicate the advantage of this method.

Finally, surgical diathermy shows a very low mortality in conditions of malignant ulceration. The whole procedure is simple and practically bloodless; even if definite cure cannot be assured, electrocoagulation or dessication relieves the suffering and stops the hemorrhage and prolongs life.

Metastases in Malignancy*

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THE widespread attention to malignancy which has taken place during the last few years has emphasized the necessity of early diagnosis. In early diagnosis lies the only hope of cure in this dread disease. When the disease first appears it is purely a local growth and in most cases is susceptible to complete eradication. Too much stress cannot be placed upon the value of early recognition of the type of new growth coming for examination.

Experience with large numbers of patients suffering from malignant growths of all kinds has taught the writer that too little emphasis has been placed upon the rapidity and frequency of metastases. Once this knowledge is grasped by the physician no case of suspected malignancy will pass through his hands without a most careful search being made for metastases. All too frequently the patient has metastases in the lungs, the liver or the bones at the time he comes for his first examination. If these are found, it should not lead the physician to cast the patient into utter despair and hopelessness but should aid him in outlining the best method of treatment. In advanced cases of malignancy the patient's greatest hope lies in keeping up his fighting morale. Once that is broken down, whether due to the action of misguided friends or to the unwise words of a bluntly spoken physician, the patient goes down grade rapidly. The physician has a profound obligation to sell good cheer and hope to the patient suffering from an incurable malignant growth.

ROUTES TAKEN BY METASTASES.

Every physician realizes that malignancy metastasizes by direct extension in every case. This can be seen, felt and demonstrated in other ways.

Lymphatic metastases in carcinoma have been stressed so long and seen so often by the physician that this route has also become a household word among the members of the medical profession.

The hematogenous route has not received sufficient recognition. In the past the feeling among many men has been that sarcomas alone spread to distant parts of the body through the blood stream. It does not appear that too much emphasis has been placed upon this method of metastasis in sarcoma, for too great stress cannot be placed upon this fact. On the other hand, it seems that too little attention has been given to metastasis through the blood stream in carcinoma. In fact this method of metastasis is under daily observation by the writer.

FREQUENCY.

1. Direct extension is found in 100 per cent of cases of malignancy. In the skin and mucous membrane it is shown by the growth beginning as a small lesion and gradually enlarging as time goes by. It is not uncommon for one to see a cancer on the face which has destroyed an area from 2.5 to 7.5 cm. in diameter. In the mucous membrane of the mouth the same process occurs, especially in the squamous cell type of carcinoma. What appears at first to be a harmless milk white stain, later begins to thicken and extend downward and laterally, invading all tissues, including the bone. This type of malignancy is very resistant to all forms of treatment and steadily advances by direct extension in spite of the most painstaking care by the physician. In carcinoma of the uterine cervix metastasis by direct extension manifests itself by gradual enlargement of the malignant ulcer on the cervix and later by extension onto the vaginal wall in the vault and still later by invasion of the parametrium and even into the bladder. A case recently came under my observation where carcinoma of the cervix invaded the ilium by direct extension.

2. Lymphatic metastases occur early in carcinoma of the breast and carcinoma of the cervix of the uterus. One cannot fortell which case will metastasize early and which late. Frequently one sees a very small tumor in the breast with extensive lymphatic metastases in the axilla at the time the patient has first discovered the presence of the lump. In other cases the primary tumor will be large and no lymphatic metastases can be found. Statistics show sixty-four per cent of lymphatic metastases in carcinoma of the breast at the time the patient first presents herself for examination. In carcinoma of the uterine cervix the percentage of lymphatic metastases is high.

3. Hematogenous: Sarcomas are notorious for early metastasis through the blood stream. Certain types of sarcoma are more prone to metastasize in this manner than are other types. The small round cell sarcoma, especially when it involves the lymph glands, is very vicious. Usually hematogenous metastases have occurred before the diagnosis is made. Sarcomas of the testicle metastasize early through the blood stream, usually entering the lungs. The same may be said regarding periosteal sarcomas. So universal is hematogenous metastasis in this type of sarcoma that most surgeons amputate the extremity only because no better treatment is known, rather than with the hope that the disease can thus be cured.

Giant cell sarcoma is much slower in extending to distant parts of the body. When located as a central lesion in the medulla of long bones, Bloodgood treats it as a benign new growth, curetting out the mass and crushing in the cavity. His opinion is ably supported by years of research in the pathological study of bone tumors as well as by clinical results. Osteosarcoma metastasizes late and is usually recognized early enough so that surgical removal cures the patient.

Carcinoma: Hematogenous metastasis has come under my observation so frequently that I wish to lay special emphasis upon it. Certain types of carcinoma show early hematogen-

*Read at a meeting of the Nebraska Radiological Society, Omaha, May 12, 1924.

ous metastases. Carcinoma of the prostate is the worst offender. In practically every case hematogenous metastases have occurred at the time the diagnosis is made. This type of growth shows great predilection for the bone, usually invading the pelvic bones and the spine, later attacking the ribs and even the long bones. Carcinoma of the prostate metastasizing into bone produces hyperactivity of the osteoblasts, resulting in new bone formation which is readily demonstrable on the roentgenogram. At the same time that this new bone is being laid down under the periosteum the growth is invading the medulla and the Haversian system, filling these spaces with a yellow colored, hard, new growth. As the growth advances the blood forming power of the medulla is destroyed, producing in the patient a peculiar pallor and anemia. The end is always fatal.

Carcinoma of the breast chooses the hematogenous route rather frequently. Five per cent of all breast carcinomas thus metastasize into the bones of the spine, ribs, pelvis and extremities. The x ray findings in bone carcinoma secondary to breast carcinoma are always those of bone destruction in the cortex which gradually extend, coalesce and produce pathological fracture if in the long bones, and c r u s h i n g, if in the spine. There is little or no evidence of repair, the process gradually extending until death. In a smaller percentage of carcinomas of the breast a predilection is shown for the lung so that frequently, when the patient first comes for examination, hematogenous metastases are found in the lungs. These are best detected by the roentgenogram showing thereon as single or multiple small spherical areas of increased density in the parenchyma of the lung. A case recently came under my observation where breast carcinoma metastasized to the brain.

Carcinoma of the ovary occasionally metastasizes by the hematogenous route. One such case came under my observation which metastasized to both breasts, the glands on both sides of the neck, in both axillae and into the scalp.

SUGGESTIONS FOR IMPROVEMENTS.

1. Education of Laymen: The American Society for the Control of Cancer has called attention to the need of educating the laymen and has put into action a program of this nature. During the autumn months each year a special "Cancer Week" is conducted throughout the United States. During this week public meetings for laymen are held in all towns of any size, at which lectures are given about various phases of the cancer problem and lantern slides and moving pictures are shown. Special emphasis is placed upon the value of seeking medical advice early when trouble is noticed.

There are several places, however, where the family physician can act as teacher in his daily contacts with his patients. The idea has become prevalent among our grandmothers that when a woman approaches the climateric she should bleed excessively at the period or between periods. This idea has been handed down from mother to daughter to the present generation, so that most women think such a phenomenon a physiological process. Quite the contrary is true. Every woman should be tanght that when she approaches the *menopause* she should *quit bleeding* and that *irregular* or *excessive bleeding* is *nature's danger signal*. This danger signal always means that something is wrong. It may be a benign condition such as a uterine fibroid or it may be a cancer. The important thing is to find out what it means so that proper treatment may be begun at once.

People who suffer from "indigestion" after the age of forty should be taught that when this does not respond to the usual treatment within two weeks that it demands a thorough examination to determine its cause.

The patient of middle life or older who suffers from "piles" should have a careful examination, including visual, digital and proctoscopic and in many cases x ray, to determine whether a new growth may not be beginning.

Any individual in whom a sore appears on the skin or mucous membrane, if it does not heal in two weeks time, should have treatment which will eradicate the disease. During the last half of life such sores usually become malignant later on if not frankly so at the beginning.

2. Thorough Examination: If education of the layman teaches him the importance of coming early to the physician, the physician in turn, must

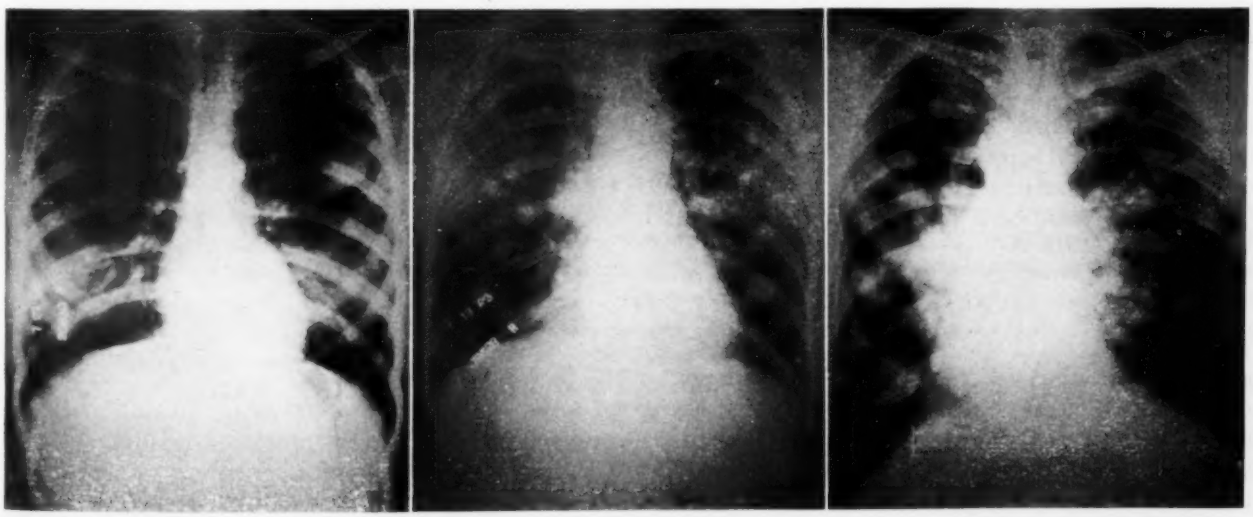

Fig. 1—Sarcoma in the left lung. This metastasized through the blood stream from the primary growth in the upper end of the left fistu'a.
Fig. 2—Multiple carcinomas of both lungs. These entered the lungs through the blood stream from a primary growth in the breast.
Fig. 3—Multiple metastases in both lungs which entered through the blood stream from a primary mixed cell tumor of the parotid.

feel the obligation of making a thorough examination sufficiently accurate to detect the beginning of a new growth. Early diagnosis requires not only skill and experience but the mental image of all possible early signs and the diligence to rule them all out by the method of exclusion.

3. Early Treatment: After the patient has come early and the suspicion has been confirmed by an early diagnosis, the whole structure crumples in ruins unless the patient can be induced to undertake early treatment. Its advantages must be made clear rather than that fear should be used as a club to drive him to act.

ILLUSTRATIVE CASES.

Brief abstracts of a few cases in which interesting and instructive metastases occurred will help to give a clearer understanding, I hope, of their importance.

Case No. 20630, Miss I. B., 17 years of age. The patient entered the hospital for treatment of a large mass attached to the outer aspect of the wing of the left ilium. This mass appeared months after the amputation of the left lower extremity in the middle of the thigh, because of a periosteal sarcoma arising from the outer aspect of the upper part of the shaft of the left fibula. A few months later a mass appeared in the left iliac lymph glands. About the same time a new growth was found at the base of the right lung. Still later a growth appeared in the upper part of the shaft of the right femur and still later metastases occurred in the brain from which she succumbed. This case illustrates metastasis of periosteal sarcoma to other bones, lymph glands, lung and brain. These sarcoma cells had entered the circulation before the amputation was done.

Case No. 17537, Mr. F. C., 17 years of age. This young man came for treatment of multiple metastases in both lungs which followed a sarcoma of the left testicle which had recently been removed surgically. These were present at the time of the operation and rapidly increased in size. Later masses were demonstrated in the liver.

Case No. 19528, Miss C. S., 35 years of age. This young woman came complaining of a nonproductive cough which came on following the recent removal of the right breast. She had had a removal of the left breast one year previously. Both had been diagnosed as carcinoma. The roentgenogram revealed many areas of increased density scattered throughout both lungs. One is led to wonder why x ray examination of the lungs had not been made earlier.

Case No. 19385, Miss M. B., 57 years of age. This patient was told she had a carcinoma of the left breast when it was operable but she refused operation. At the time she came to me the inoperable stage had been reached. The whole breast was involved and fixed to the chest wall, the axillary supraclavicular and cervical lymph glands were involved and there were multiple small nodules in the skin of the anterior chest wall. Later the opposite breast became involved, as did the liver and the brain.

Case No. 21122, Miss M. H., aged 39 years. This patient had an enucleation of a tumor in the left breast following which a recurrence appeared. Later she developed a continuous backache which soon became disabling. X ray examination revealed destructive bone metastases in the third lumbar vertebra, the pelvic bones and the right femur.

Case No. 21437, Miss M. S., aged 35 years. This patient had had a panhysterectomy for carcinoma of the cervix after which she developed a recurrence in the vaginal vault. Four years later she developed a sciatica and examination showed a mass in the iliac fossa. X ray showed extensive bone destruction of the ilium corresponding to the location of the palpable mass. This is an unusual case in which carcinoma of the cervix of the uterus invaded bone by direct extension.

Case No. 20137, Mr. E. B., aged 65 years. This patient came because of urinary retention. Examination showed a prostate gland enlarged four times its normal size, very hard and nodular. X ray examination showed metastases in the pelvic bones and lumbar spine.

It would seem, then, that too great emphasis cannot be placed upon the necessity of carefully searching for metastases in every case of malignancy.

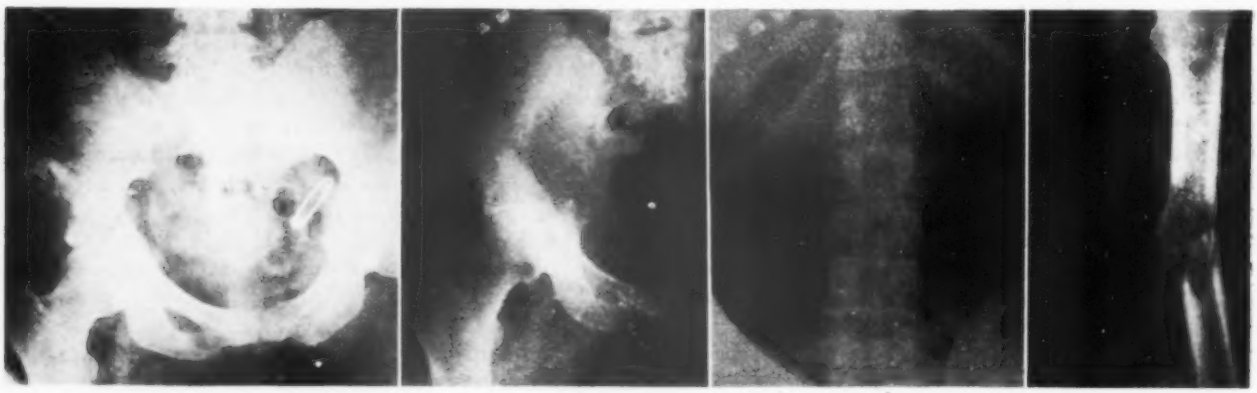

Fig. 4—Carcinoma of the wing of the ilium. This had entered the bone through the blood stream from primary carcinoma of the breast.
Fig. 5—Carcinoma of the lower border of the ilium invaded by direct extension from carcinoma of the parametrium, recurrent after panhysterectomy from carcinoma of the cervix. This is the only case the author has seen where cervical carcinoma invaded the bone by direct extension. Most patients die before this occurs.
Fig. 6—Carcinoma of the body of the third lumbar vertebra, entering through the blood stream from primary carcinoma of the breast.
Fig. 7—Carcinoma of the femur with pathological fracture, entering through the blood stream from primary carcinoma of the breast.

Physiotherapeutic Medicine*

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THE modern physician is suffering from therapeutical hunger. His alma mater has impressed upon his mind the necessity of a correct diagnosis which, by the way, is nearly always impossible, and to this end has led him along the labyrinthal channels of investigation without end and has dropped him at the threshold of therapeutics. When a physician has arrived at a diagnosis satisfactory to himself, he turns to his volumes on therapy there to find, to his dismay, nothing positive or tangible; all is palliative, symtomatic and empirical, and treatment becomes a personal choice in experimentation.

The physician suffering from therapeutic hunger quite naturally drifts to drug nihilism. When, if he would investigate the positive capabilities of physiotherapy his appetite, to a certain extent, might be appeased.

The persistent mystery of electricity, its intense modernism, and the almost unlimited possibilites make it a most interesting and fascinating study of this progressive age. The more one studies the marvelous movement of electrons of matter, the greater his profound belief in the scientific creation of the universe and his respect for the one great universal law which regulates the creation of material things.

To one interested in physics, the study of electricity affords not only a broader grasp of tangible things but a view into the mysteries of speculative phenomena and a realization of some things of which he has dreamed.

The mysticism and assumption of yesterday are capable of demonstration today. Some of the world's labyrinths which have been unfathomable are becoming easy of access and an understanding of creative phenomena is becoming more and more a possibility.

With the aid of the x ray and the ultramicroscope, the theory of electricity being a condition has been exploded and the proof of its definite substance realized. We now know that a current of electricity consists of a journey of electrons through a conductor.

We all recognize the usefulness of electricity in a commercial way but comparatively few realize its possibilities as a therapeutic measure.

The medical profession is conservative and rightly should be so. The medical man comes in contact with more failures of things to fulfill promises than those engaged in any other line of human endeavor; so it is not uncharitable to say that the medical man is more or less a skeptic. Having seen so many complete failures in drug therapy, he comes to disbelieve in therapeutic measures, yet is often the most gullible to the promises of the visionary promoter. When he went forth armed with a diploma he was full of enthusiasm and confidence in his ability to cope successfully with the afflictions of mankind; gradually one by one his idols fell to earth crushed by the heel of experience. There have been so many unfulfilled promises of what electricity would do in a therapeutic way, made by honest, but over-enthusiastic, men that not only distrust but disgust has seized hold of the medical profession. Here again a physician may become interested in the promises made and being willing to make a trial of its efficiency, he purchases an apparatus the workings of which in a few minutes are explained by the salesman who gives a glowing account of its wonderful capabilities, gives the doctor a cordial handshake and bids him a friendly adieu. The physician knowing little or nothing of the fundamentals of electricity, must perforce apply it in the scientific manner of the Indian voo-doo. He fails to secure results and decides that electricity is much over-rated and that he is stung again.

Allow me to say to the prospective employer of electricity as a therapeutic agent, do not attempt to erect a structure without a proper foundation. No chain is stronger than its weakest link and a lack of knowledge of the fundamental principles upon which all electrical application is based spells therapeutic failure.

Every one of us has spent years in the study of the physiological action of drugs and the indications for their use; yet we will undertake the application of electricity after a few brief instructions from a man who does not assume knowledge of medical subjects.

It is true that many physicians have employed electric currents in a more or less perfunctory manner and are convinced that they are useful in nervous disorders, but the knowledge of their greater usefulness in circulatory and acute conditions has not yet been acquired.

During the few years just passed an intensive study has been made of cardiovascular conditions and a much better understanding from a diagnostic point of view, attained; but it must be admitted that drug therapy in these conditions has not been able to keep step with this advancement. In fact, the medicinal management of cardiovascular conditions is about the same as that of thirty years ago. With those who are familiar with the physiological effects of high frequency currents the management of vascular disorders has become easier through early recognition of the ear marks of these conditions and the prompt institution of preventive measures.

AUTOCONDENSATION.

The sphygmomanometer is the physician's Paul Revere in cardio-renal disturbances. It bears a message of the danger to come to the individual who has hyperpiesia. The term hyperpiesia was suggested by Prof. Allbut as the proper one to be applied to that condition of hypertension, persistent high blood pressure, which exists for months and even years before cardiovascular changes are or can be recognized.

Nearly every physician possesses an instrument for the estimation of

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blood pressure, but the too common practice of ascertaining the systolic pressure only, is but little avail in blood pressure interpretation. As an instrument of diagnosis, I know of none as useful as the sphygmomanometer. When properly used and its readings understood it reveals to us the condition of the patient that in no other way can be realized. Blood pressure interpretation is a science almost in itself and must be studied in the most painstaking manner to be appreciated. Systolic pressure by itself tells us but little, but when combined with readings of the diastolic, pulse pressure and pulse rate it reveals to us an indelible mental picture of the cardiovascular condition of the patient.

The time at our disposal will but scarcely permit the mention of some of the important advantages of the use of physical measures in practice, but I desire to bring to your attention some few points in blood pressure interpretation which are of prime importance to us all, not only from a diagnostic but a therapeutic point of view.

In the consideration of blood pressure readings it is of prime importance to know the deviations from the so-called normal pressures. It is easy to understand how futile it is to discuss pathologic changes without a fair idea of the variations which one obtains in normal pressures. There is no hard and fast rule, and we can but approximate the normal pressures of any individual because a variation of ten points up or down may and usually does occur in the normal during any 24-hour period. The variations may be due to any of the following factors, viz: position of the body, exercise, nervous excitation, time of day, proximity to a meal, character of food, sleep, pain, etc. All pressures increase with weight.

All blood pressure readings, especially the first, should be taken with the patient in the horizontal, sitting and standing positions. If the normal readings in these positions are reversed they indicate vasomotor insufficiency, myocardial weakness or an accumulation of blood in the splanchnic area so common in such cases of nervous insolvency as neurasthenia. With a normal heart the pulse pressure will fall, upon changing from the horizontal to the erect position; if there should be a rise, it points to cardiac hypertrophy. The diastolic pressure in the normal individual rises in changing from the horizontal to the erect position. If it falls, look for valvular disease of the heart. Should there be a fall of all pressures in changing from the recumbent to erect position, it points to cardiac dilatation which an examination of the heart will confirm. A continued pulse pressure, higher than the diastolic, points to failing heart; although such a condition may prevail for a short time in hyperpiesia. A high diastolic pressure always means great vascular tension, and, when constant, points to kidney involvement and possible cerebral accident. A normal systolic, high diastolic with a high pulse rate, suggests a poor myocardium. The deficient heart muscle requires an increased rate of contraction to overcome the peripheral resistance or diastolic pressure. This condition leads to cardiac dilatation. It would be interesting and profitable to go into the details of all cardiovascular conditions as interpreted by the sphygmomanometer but time will not permit; but I must call your attention again to hyperpiesia because of its prime importance. It is a premonitory indication of pathological changes yet to come and is not, as is generally supposed, the result of arterial changes. In other words hypertension is now considered to be the primary cause of structural changes in the arteries. Persistent hypertension naturally causes cardiac hypertrophy which develops to overcome the resistance. This is a physiological and not a pathological process. When a case of hyperpiesia is found, we may know that sooner or later cardiovascular changes will follow unless the cause be removed. The argument that hypertension is compensatory and should not be interferred with, will not hold good as the condition antedates by months and even years the cardiac and kidney lesions.

Treatment: Hyperpiesia or persistent hypertension prior to cardiovascular changes is easily controlled by autocondensation. The patient should be treated daily until the systolic pressure reaches the same point after each treatment for three days in succession; this point is known as fixed tension; and it will be impossible to further reduce the pressure. When the point of fixed tension is reached, the frequency of treatment is so regulated that this point may be maintained. The blood pressure in hyperpiesia can always be reduced to normal and be maintained if it has not exceeded 170 systolic and many cases also when it has reached a much higher reading. In cases of nephritis with toxic phenomena, while the pressure may be lowered, it cannot be maintained without increased kidney elimination.

MEDICAL DIATHERMY.

It is quite likely that you are more interested in high frequency currents than those of other modalities and would prefer to have pointed out some of the most important uses of this current so we will briefly consider some of the uses of medical and surgical diathermy.

The name diathermia has been accepted as the proper term to be applied to the method by which an elevation of temperature is produced in the tissues of the body without destructive effects.

Other terms such as *thermopenetration*, *endothermy* and *transthermia* are sometimes employed instead of the generally accepted one, *diathermy*.

D'Arsonval was the first man to show that high frequency currents, if allowed to pass through the body, produce an increase of the temperature of the tissues, but it remained for other investigators to apply the method to the treatment of a variety of diseased conditions.

The passage of an electrical current through the tissues of the body will always produce heat, but the continuous direct current produces the greatest degree of heat at the points of contact with the electrodes, and, in order to secure penetration of heat, the application becomes too painful. The faradic and the ordinary alternating city light currents also produce heat but the violent contraction of muscles precludes their use for this purpose.

It has been found that the high frequency current which oscillates millions of times per second is the only form which can be passed through the tissues of the human body without pain, muscular contraction or any discomforture other than that of heat. The explanation of this lies in the rapid oscillations which prevent ionic or chemical effects.

It was not until 1910 that the therapeutic value of diathermy was brought out by Nagleschmidt, through the agency of an apparatus designed by himself. During the same year, Doyen reported his experiments with high frequency currents in the treatment of cancer. He found that normal cells of the body are able to withstand a temperature of 140 degrees F., while cancer cells are destroyed by a temperature of between 122-131 degrees F.

Physiology: Heat for the aleviation of pain has been employed by man since history began. We are familiar with the soothing effects of the local application of heat in the form of hot bricks, poultices, hot water bottles, electrothermic pads, etc.

The physiological effects of hyperemia and skin reflexes were not understood by our grandmothers, but they did know that heat applied to the skin would relieve pain.

By means of high frequency currents we are now able to apply an internal poultice to the organ itself. By application of properly sized electrodes we are able to concentrate heat in any part of the body desired. Diathermy not only soothes pain by its effects upon the autonomic nerves, but dilates the veins allowing an increased supply of freshly oxygenated blood from the arteries to take the place of the stagnant blood of the affected gland or tissue.

The passage of high frequency currents through the tissues of the body sets up a violent agitation of the electrons of which the tissues are composed; the resistance offered to the movement of electrons results in heat. As the density of the high frequency current is under our control, we are able to increase the agitation of electrons and thus raise the temperature of any part desired. While every tissue traversed by the current will resist its passage and thus produce heat, the greatest concentration may be directed to any part by properly shaped electrodes.

There is more or less heat introduced into the tissues by a high frequency current; but the greater part of the heat is produced by violent agitation of the electrons of the tissues. In other words, there is an actual generation of heat in the tissues themselves.

Conductive heat applied to the skin has but little penetration and its effects are principally reflex in character; no heat of importance reaches the tissues underneath the skin. Radiant heat from high power electric light lamps is more penetrating than conductive heat, but it is quite improbable that it penetrates to any material depth of tissues underneath the skin.

The greatest resistance to the passage of direct current electricity is offered by the skin, hence the heat effects are concentrated therein. The skin offers very little resistance to the passage of high frequency currents, the heat density being equal throughout the tissues between the electrodes of the same area. Bone offers the greatest resistance of any of the tissues of the body and retains the heat for a longer period of time; after becoming thoroughly heated, bone slowly gives up heat to the surrounding tissues, making this feature a useful one in therapeutics.

The cell is the physiological working basis of all vegetable and animal organism and without a proper electrical balance ceases to function.

The human body is the most marvelous laboratory of which we have conception, each cell being a little workshop where the mysterious work of metabolism is carried on. The animal cell is the true analogue of the primary cell of the battery. The contents of the cell proper is a colloidal substance which we call protoplasm and has an alkaline reaction; within this mass of protoplasm is the nucleus, separated therefrom by a semipermeable membrane through which the potential of the cell is maintained by osmosis. The nucleus is composed mostly of chromatin or nuclein and is of an acid reaction probably due to nucleic acid. The vitality of the cell depends upon the permeability of its membranes, maintenance of potential, and oxidation; these dependable qualities may be seriously impaired by excessive oxidation brought on by active exercise, infection, worry, fear, anxiety or trauma. Certain drugs and glandular function play important rôles in cellular vitality. Oxidation, while a normal process of cell function, may be overworked to such an extent that the protoplasm may be changed to an acid reaction, thereby changing its electrical potential to such an extent as to destroy its function and possibly the cell itself. In that condition called acidosis all cell function is seriously impaired and many cells are destroyed. In order for these billions of workshops to keep up their metabolic efficiency there must be a sufficient supply of proper material and an escape for waste products, without which work ceases and the shops become effete junk and have to be removed by other work shops or become a nidus of that condition which we call disease. We know that heat applied to the cell increases oxidation and may be so concentrated as to destroy it. While medical diathermy properly applied will greatly increase the supply of fresh arterial blood, it also hastens, through the channels of dilated capillaries, the escape of waste products and thus increases cellular efficiency. The mechanical bombardment of the cell by any high voltage current increases its potential and incites greater activity in the workshop and results in an increased metabolic output. On the other hand the cell may be overworked by a too prolonged application of the current and result in cellular dysfunction, as evidenced by sore muscles and fatigue.

Clinical observations and many laboratory tests show conclusively that a moderate degree of heat increases cellular activity and that all electric currents increase metabolism.

The end result of all internal glandular and muscular activities, incidental to the maintenance of life, is heat; and the level of vital activity may be inferred from the amount of heat produced.

Diathermy relieves congestion wherever present because of the marked activity of the arterial circulation. Anemia of the splanchnic area ensues, visceral congestion is relieved. The liver, the intestines and other organs within the abdominal cavity are made to disgorge the stagnant pools of blood which bathe their structures. When the action of the diathermic current has subsided and the blood stream returns again to its normal channels, freshly oxygenated blood enters in greater abundance into the previously anemic and venously congested area. The parts are placed in a better state of defense against invasion of toxins and bacterial colonies.

It will be found that in individuals with subnormal temperatures the application of diathermy will raise the temperature to normal, improve the appetite, increase weight, promote sleep and a feeling of comfort.

The passage of high frequency currents through any portion of the body raises the temperature of the part several degrees. The heat, while concentrated between the electrodes, if long continued will be distributed by the general circulation and will heat up the entire body. If it were not for the increased activity of the circulation set up in the tissues under the electrodes by application of diathermy, the parts would become very much overheated.

In hand-to-hand diathermy, the temperature varies in different regions of the body. The highest temperature will be observed in the wrists and becomes gradually lower as the current approaches the body. The temperature in the axilla and in the mouth is about the same; in the lower limbs, it gradually falls from the body to the toes where there is no perceptible change. In foot-to-foot diathermy, these conditions are reversed, the highest temperature will be found to be in the ankles and popliteal space. When the current is directed through the abdomen or chest, the temperature in the mouth is little affected, the heat being concentrated between the electrodes. Diathermy applied to the knee joint is more effective in raising the body temperature than when applied to the body itself; this is probably due to the close proximity of the electrodes to the circulating blood and to the heating of it as it passes.

The elevation of temperature caused by diathermy has nothing in common with fever from disease. After cessation of treatment the temperature soon returns to normal. The activity of heated blood set up by the rapid oscillations of the current causes flushing of inflamed tissues, which promotes drainage and absorption of inflammatory products and deposits. Heavy diathermy treatments cause, in the obese, a liquifaction of fat and consequent increase of acetone in the urine.

Diathermy produces marked analgesic effects and relieves all kinds of pain. Relief from diathermy is more lasting than from conductive or radiant heat. The long continued relief experienced by heating the deep tissues is due to the slow return to normal temperature; the cooling of the tissues takes place by conduction through the circulation while skin cooling is rapid through radiation.

Ordinary electric currents follow the path of least resistance, but diathermic currents take the shortest path between the electrodes. In heating tissues the only consideration is the structural mass of the tissues between the electrodes; the greater the mass, the greater amount of current required. A low milliamperage applied for a long time will heat the part more effectually than a heavy current for a short time, or even the same time.

The deep effects of heat may be studied through the laryngoscope by application of diathermy to the larynx or by placing one electrode over the hypogastrium and the other over the sacrum of a female and observing through the speculum the changes taking place in the cervix. I would suggest these maneuvers to those who doubt the deep effects of diathermy.

All vital energy and activity come from the cumbustion of organic material. The more fuel we burn the greater our activity and vitality. It is therefore apparent that stimulation of metabolism raises the energy of the organism and is of first importance in the conversation of health.

The production and elimination of body heat are prominent factors in the treatment of diseased conditions. The abstraction of heat from the body necessitates oxidation to replace the lost heat. Any condition that promotes heat discharge stimulates oxidation and metabolism.

Health and vigor are associated with active metabolism. Anything which interferes with dissipation of heat lowers metabolism and produces debilitating effects, examples of which are found in low diet, indoor life, and sedentary habits. Practically all cases that come to the physician are ones of defective anabolism or katabolism, many of which are amenable to diathermy.

There is no other means at the command of the physician so potent in correcting deranged metabolism as high frequency currents.

The knowledge of the density of current enables us to concentrate heat at any point desired. For example: in pneumonia we find the affected area to be near the anterior surface of the lung, and desiring to concentrate the heat at the point of greatest activity of the disease, we place a large electrode on the back and a small one in front. If the disease is one affecting an entire lobe we use electrodes of equal area.

Theoretically the effects of heat currents vary as the square of the amperage. If a milliamperage of 200 is being given and a change is made to 400 milliamperes, the meter reading has been doubled but the heat effects have been quadrupled; if the milliamperage be increased from 200 to 800 the heat effects have been increased sixteen times.

In practice, upon the living subject, this principle does not hold because when strong currents are employed the body reflexes are stimulated to such an extent that all functions which regulate heat in the body are stimulated to combat the heat from the outside, but when a smaller current strength is employed the reflexes are not stimulated allowing the current to get by.

Perfect technique is important in all treatments by diathermy. The apparatus must be of proper construction and in perfect order; all connections must be secure and perfect coaptation of electrodes be secured before the current is turned on. The current must be under perfect control of the operator and turned on gradually until warmth is felt by the patient and continued at that point for at least five minutes after which the current strength is increased gradually to the point desired; and when treatment is completed, the current must be gradually reduced to zero

Time of Treatment: The resistance of the skin, the thickness of fat underneath the skin or anywhere between the electrodes, the moisture of the tissues, the density of all the tissues, the reflexes of the patient, the distance between the electrodes, the size of the electrodes and degree of temperature desired, all enter into the consideration of time of treatment. The greater the skill of the operator the better the results.

Contra-Indications and Precautions: Medical diathermy is positively contra-indicated where there is a recent history of hemorrhage; no matter where the hemorrhage is, that part must be avoided. While papilloma

of the bladder are easily destroyed by diathermy, a most disagreeable hemorrhage might occur therefrom through an application of the high frequency current to the prostate. It should not be applied within twenty-four hours of the menstrual period. Pregnancy is a positive contra-indication to its use below the waist line.

Diathermy powerfully stimulates the secretion of glandular organs and consequently should not be applied to the thyroid gland in hyperthyroidism. It should not be applied to any place where there is a collection of pus. The streptococci and staphlococci are increased by the stimulation and there might be sufficient absorption to produce pyemia; however, diathermy is often of great service in pus accumulations where there is good drainage. It should not be applied to an acutely infected joint. It is therefore contra-indicated in acute rheumatism. It is best to avoid its application to sinuses of the head unless there is good drainage. It should not be employed in gallbladder infection unless there be drainage through the common duct. Gastric, duodenal and other internal ulcers are positive contra-indications to diathermy.

SURGICAL DIATHERMY.

Surgical diathermy is rapidly becoming the method of choice in dealing with malignant disease about the face, mouth and throat. It differs from medical diathermy simply in the density of the current applied. In medical diathermy the object to be attained is to raise the temperature of the tissues without destructive effects, while in surgical diathermy the object is to destroy the tissues by heat. When the current is concentrated by means of special electrodes, the current density may be increased to a degree sufficient to destroy not only soft tissues, but bone as well.

Considerable skill and practice are required to be able to judge the amount of heat required to completely destroy malignant tissue without unnecessary destruction of normal tissue.

Surgical diathermy contemplates two distinct methods of destruction of tissues and are known as dessication and electrocoagulation.

DESSICATION—Dessication is a dehydrating process, rupturing the cell capsule and transforming it into a dry mass. For this purpose a needle point instrument known as a fulguration electrode is employed. The electrode may or may not be brought into contact with the tissues. Usually an air space of from 1/8 to 3/4 of an inch is interposed.

The advantages of desiccation are: The rapid and effective destruction of abnormal growths without the loss of blood; precision, considerable area may be destroyed without infringement upon normal tissues; sterilized wounds result; the blood and lymph channels are sealed, which lessens the likelihood of metastasis in malignant cases; the cosmetic result is good, leaving no contracted cicatricial tissue.

The area and depth that may be desiccated with one application are controlled by the operator and depend not only upon the current strength, but on the distance of the electrode from the part, time of application, density of tissue, and whether the unipolar or bipolar method be employed.

After desiccation, a dry crust forms and the time required for separation depends upon the character of the tissue treated. In case of mucous membranes the desiccated tissue soon becomes macerated by the secretions and may separate in a few hours, while on the skin surface 10 to 21 days are required. Regeneration of skin takes place underneath the crust. The crust should remain until healing has taken place underneath. No application to the crust is necessary; let it dry and fall.

Desiccation is applicable to the treatment of warts, moles, nevi, tattoo marks, keloid, papilloma of the bladder and urethra, urethral caruncle, urethral granulations, closed crypts of Morgagni tumors in the nose, throat, mouth and larynx, diseased tonsils and hemorrhoids. It is specific in tuberculous ulcers of the throat, rectum and bladder. Fissures that can be reached by the electrode require but one application.

A local anesthetic such as procain may be used where the growth is non-malignant. In rare cases, a general anesthetic is required. Where the field of operation is in the mouth and throat, a topical application of cocain and adrenalin is usually sufficient.

ELECTROCOAGULATION—Doyen employed the high frequency current for the destruction of cancer cells by heat. The cell destruction in his method is the result of tissue coagulation. The active electrode is applied directly to the part with the opposite electrode placed on some indifferent part of the body. The tissues are coagulated to almost any desired depth by simply prolonging the time of application. This method is diathermy carried to the point of destruction of tissue. Electrocoagulation has been employed for the treatment of benign as well as malignant tumors by Doyen and Luys in France, Berndt in Austria, Nagleschmidt in Germany, Clark and many others in America.

The advantages of electrocoagulation are: (1), The operation is bloodless; (2), there is no shock; (3), the parts are thoroughly sterilized; (4), danger of metastasis is practically nil; (5), tumors otherwise inoperable may be safely removed; (6), the operation is easily and quickly done; (7), postoperative adhesions are rare; (8), rapid convalescence.

The disadvantages are: (1), Destruction of important blood vessels and nerves; (2), secondary hemorrhage from important blood vessels which have been overheated; (3), formation of keloid in operations on skin surfaces; (4), destruction of periosteum when operating on tissues close to bone.

The difference between effects of electrocautery and diathermy, lies in the fact that in the former the tissues are heated from without, while in the latter the heat comes from the tissues themselves. In electrocautery a hot electrode is plunged into the tissues and is rapidly cooled, resulting in a superficial carbonization. In electrocoagulation the tissues are gradually cooked for some distance about the electrode.

It is impossible to state the amperage required in any particular case. Much depends upon the size of the electrode. Generally speaking, the depth of coagulation is the same as the diameter of the electrode, but much depends upon the strength of current and time of application. An amperage of 300 is sufficient in small operations, while in larger operations a current strength of 2,000 milliamperes may be required.

Technic: After the electrodes are properly placed, switch on the current at zero and gradually increase its strength until the effect desired is produced. The current should be switched off as soon as sparks are seen to jump from the edge of the electrode to the surrounding tissues. If, for any reason, sufficient coagulation has not taken place when the sparking appears, the tissues may be saved from carbonization by the application of a few drops of normal salt solution, which acts as an insulator. Always switch off the current before removing the electrodes. In small operations the coagulated mass should be left *in situ* to slough later on. Anatomy of the part to be treated, must be understood in order to avoid coagulating the walls of important blood vessels and destruction of nerves. If the part to be removed be pierced by large arteries they must be ligated before the operation. Care must be exercised when coagulating tissues over bone, as destruction of periosteum means slow convalescence. Considerable edema follows operations in the mouth and throat, so much so that the operator should be prepared for tracheotomy. However, this extreme measure is seldom called for.

In operating, the depth of coagulation may be roughly estimated by the width the tissue is dehydrated around the electrode; the depth being approximately twice the distance of coagulated tissue at the side of the electrode. Again, this may be no guide at all, much depending upon the rapidity of the operation. When the current is applied slowly, giving the circulation time to adjust itself, the coagulation will be more uniform and charring of tissues will be obviated.

As the tissues about the electrode become dried out as evidenced by their pale color, there is a tendency for the current to spark across to moist tissue beyond; the result of this sparking is carbonization or charring of the normal tissue, which should be avoided. As soon as the tissue is coagulated there will be an escape of particles of steam.

Another factor in depth of coagulation is the degree of moisture in the tissues. The drier the tissues the less the penetration before sparking takes place. Periosteum dries quickly and sparking occurs very soon after application.

When the electrode is allowed to remain after the tissues have become dry, it will adhere to them and when removed will bring particles of tissue with it. This unpleasant feature may be avoided by removal of the electrode while the tissues are still moist. In case the electrode does adhere, a few drops of hot salt solution on the electrode will facilitate its removal.

CONCLUSION.

In conclusion I wish to bear this message: That should electrotherapeutic and allied measures keep pace with the advancement made during the three years just passed for a period of ten years to come, medicine will become so near a science that its practice will be a delight never before experienced.

There is no greater field in human endeavor than the opportunities offered the physician in research work along these lines, as there can be no greater satisfaction experienced by the physician than that of being able to make a discovery of something that will alleviate human suffering.

In the language of political platforms, we point with pride to our accomplishments.

Physical measures have solved many knotty problems in therapeutics. Many conditions heretofore pronounced not amenable to any known method of therapy have been relieved. Many diseases of the skin that a few years ago caused the physician an endless amount of worry have been conquered.

The management of bruises, sprains, fractures and many other types of trauma have been evolutionized by men who practice physiotherapy.

The advancement made in the management of malignant cases by physical measures has been marvelous and methods along this line are still improving.

Many conditions due to nervous dysfunction have recently been successfully treated by physical measures that heretofore have been poorly managed or not treated at all for want of knowledge of therapeutic measures.

The research work, during the few years just passed, carried on in cardiovascular conditions has resulted in nothing new from the standpoint of drug therapy. All the advancement made in the management of these cases has been made by men investigating the possibilities of physiotherapy.

Pulmonary, hepatic and renal affections that have been so long unmanageable have been successfully coped with by physical measures.

Many gastro-intestinal affections, such as intestinal stasis, enteroptosis, etc., are successfully treated by physical measures.

It is in gynecological work where physical methods of treatment have made the greatest success. Many cases heretofore considered surgical are now easily restored to normal. Almost all pelvic disorders of women are amenable to physical measures.

The advantages of physical measures in practice are so many and important that no physician can afford to be without the knowledge of their capabilities. It is impossible for every physician to be fully equipped with all physical apparatus, but he can employ many of them in his daily practice to the joy of himself and patient.

The charge that those who employ physical measures are drug nihilists will not stand. We are all believers in efficacy of drugs and surgical procedure, but we have learned that physical methods will relieve many conditions where drugs singly fail; and we have also learned that many conditions are relieved more easily and promptly by physical measures than by drugs, and that many surgical conditions are anticipated and successfully combatted.

He who thinks that physiotherapy is all that is needed in medicine is building air castles; he who thinks that there is nothing worth while in physical therapy may still believe the world to be flat, but he who believes that electricity and other physical measures are potent agents in relieving human ailments is safe and sound.

The profession is not asked to drop one single useful therapeutic measure, but we do ask the privilege of allowing reason to triumph, and that we be recognized as honest toilers in the field of constructive medicine.

When and How to Select Physiotherapy Modality*

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NOWHERE in the many fields of human relations and endeavors is the responsibility of conduct or act so great as that imposed upon him who elects to heal the unwell. The conscious, voluntary assumption of this trust must, by compulsion, become a natural part of the successful physician—not alone from the liable responsibility written into the laws of the various government bodies, but essentially and primarily, as a personal inherent obligation. Of the legal necessity, the many boards of legislative appointment have definite regulation and jurisdiction, to these you must conform as a matter of law and self protection. Of the unwritten, finer, moral responsibility there is no provision of authority and scrutiny by an organized body politic, to these, you respond only out of your personal obligation and self, in that degree alone, dictated by the seriousness and the sincerity with which you come to the task of your calling. Training, self respect, honesty, and a genuine desire to really serve, predicate the external manifestations of this responsibility, and, if developed and expressed, raise you beyond the praise of destructive criticism. The actions and reactions of this trust into which the physician's life leads him are so multitudinous as to preclude any general discussion here; but of its relation to the use of physiotherapy in the treatment of the sick, I would speak.

Any pioneer must of necessity and essentially be branded a believer, and an enthusiast, in this belief, at least to the extent of unbiased, open minded, fair and impartial trial and application. That there are men in your profession with the hardihood and fortitude to have blazed the trail of physiotherapy with these qualities, together with a true scientific perception, is attested to by the successful results of their efforts. The recognition of their dictum and writing, and the place to which physiotherapy has risen in treatment of the sick is due to their untiring efforts. It is these efforts and sacrifices that have made the traveling for those who come after, easy and pleasant, providing the teachings of medicine be kept as a reminder for use and indication.

Surgery never has been pronounced a cure for all ailments; were it so, internal medicine would lack adherents. Could internal medicine accomplish all in treatment, there would be no need of surgeons. Likewise with physiotherapy, had the world waited until now for this method to displace other known means of therapy, all should embrace this field and proclaim the millennium in treatment. No such absurdity has emanated from authoritive sources. The field of treatment has been added to; medicine and surgery have found a new and worthy ally, equally applicable to either type of endeavor, but in each, knowing definite limitations.

As in surgery and in medicine, so in physiotherapy, the treatment selected must depend upon a proper and correct diagnosis, which diagnosis has been reached only through an exhaustive and thorough exhibition of medical knowledge applied to the particular patient treated. That surgeon who removes an appendix on the diagnosis of a patient, is not worthy of the name. None the less disgraceful is the physician treating lumbago with physiotherapy without first having eliminated other causes of backaches. Primarily you must, to use physiotherapy with honesty, precision, and success, be a physician and a diagnostitian. Furthermore, you must never for a moment forget it.

By physiotherapy, I mean the treatment of disease by means of mechanical methods. Naturally such a definition permits of a wide latitude in selection, but here I am limiting discussion to the various electrically generated mechanical modalities, including actinic or ultraviolet ray, the high frequency, the sinusoidal and galvanic currents, each gaining energy through electricity but each embracing different properties.

The ultraviolet or actinic is the health sustaining ray of the sun. It is called ultraviolet because of its position in the spectrum, and actinic because of the chemical reaction induced on a photographic emulation exposed under its influence. Invisible to the human eye, these rays in length fall into that portion of the spectrum lying, in round numbers, between four thousand and two thousand Angstrom units, simply meaning, that the lengths of the various actinic rays are not all equal but range from four thousand Angstrom units to two thousand Angstrom units, an Angstrom unit measuring one ten millionth of a millimeter. The difference in wave lengths gains importance, one from the other, because of the different effects and chemical reaction excited in human cell tissue. With the actinic ray, in counter distinction to other therapeutic rays, the longer the wave length the more penetrating the ray, the shorter the wave length the less penetrating. In using the word *penetrating* it is my belief that it should be qualified by the word absorptive, so as to mean penetratingly absorptive; for, in my judgment, it is not penetration but absorption of the rays by the blood stream through which chemical reaction takes place. The long actinic wave, as generated by the air cooled lamp, is adapted to constitutional or biological treatment, while the shorter bactericidal ray finds greater use in local superficial conditions. It must not be understood by this, however, that the converse is true, that the long ray is not used in epidermal lesions, and the shorter ray has no application as a constitutional help. Nothing is further from the truth. The truth is, that production of rays by generators in use today produce waves of all lengths, the choice of use and selection being dependent upon ones experience and knowledge gained in clinical work. The distance from the object treated demands close attention as this phase of the technique, together with time exposure, must determine the intensity of the patient's reaction. With the long wave, air cooled ray, eighteen inches from the center of the burner to the part of the patient treated, reaching this point as nearly at right angles as possible, is the one nearest constant, easy to obtain, and maintain, and should never be varied until such

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time as accumulated experience permits. As to time, exposure should invaribly be started preferably at one and one-half minutes but never more than two minutes, increasing one minute each succeeding treatment. The latter are to be given daily at the beginning and less frequent as progress dictates. Distance is important with the water cooled short ray and combined with time exposure, determines the intensity of reaction. However, the type of pathology, the intensity desired, the concentration area treated and the end result, *all* have a determining factor in these two important phases of technique. Distance varies from twelve inches to steady compression, never enough to dehematise the area compressed. The duration of treatment is governed by many factors; but, generally speaking, it embraces from thirty seconds to that time which produces the reaction desired. Regarding the constancy of current delivered by the ordinary commercial wire and the dose intensity of each individual burner perculiar to itself, one cannot lay down rules. These are features that must be accurately determined by each individual operator but with a definite end in reaction to seek, with a little vigilance, this attending difficulty is not great. The dosages administered are regulated, considering all factors enumerated above, by the intensity of their reaction. These reactions have been expressed as first, second, third and fourth degree erythemia doses. This is an arbitrary classification, for one blends perceptably into the other. The first degree is but a slight erythemia manifested by a pink flush; the second designates a more distinct and deeper pink with a mild inflammatory reaction; the third is a still deeper and more intensive inflammatory reaction followed by some exfoliation of the skin; while the fourth degree carries the reaction to a blister. Fourth degree erythemia in no sense signifies a burn and must never be spoken of as such, but is purely an intense inflammatory reaction induced by the chemical intensity of the ray. All reactions are induced by ether wave lengths. With these differences in reaction intensity, it is readily seen that either sedative or stimulative doses can be produced as desired. No mention of individual response to this form of chemical energy has been made, primarily because the peculiar susceptibility in individuals is in no way different from other types of treatment peculiarity and can be determined only by personal contact experience between patient and physician. Generally speaking, however, one may say that blondes are more susceptible than brunettes, while the latter tan more quickly. Extensive research with laboratory experimentation in blood chemistry determinations has definitely established the fact that ultraviolet energy influences calcium and phosphorous metabolism. This influence is manifested by an increase and a stabilization of these two elements in the blood stream. Long ago it was scientifically established that the short or water cooled ray manifested considerable bactericidal properties.

With these accepted facts as criteria for actinic energy indication, diagnosis must determine the patients in whom the indications are present. Given a patient in whom the diagnosis of calcium deficiency has been determined, the indication is clear. If you seek for these, many will be revealed to you, viz., tuberculosis, rickets, psoriasis, eczema, pregnancy, metabolic deficiencies of childhood other than rickets, gastric, duodenal, varicose and many ulcers, chronic supperative conditions, asthma, hay fever, and many respiratory diseases. These are but a few of the diseases which lend themselves to successful treatment with actinic therapy and other standard treatment. The ultraviolet radiation serves in some to fix and to maintain the good obtained by other treatment. Many types of functional nerve disorders such as insomnia, neurasthenia, nerve debilitation from protracted wasting diseases, etc., obtain relief under this treatment without help from drugs.

The shorter or bactericidal ray can be successfully used in all open infections where sterilization is desired, viz., ulcers, draining abscesses, sinuses, carbuncles, furuncles, infected lacerations, acnes and many others. It should be remembered that in sinuses, bone sequestrum and any foreign body cannot be removed by actinic treatment. Here again, diagnosis will dictate the treatment necessary. One word in caution, the actinic ray is a delicate energy and will not penetrate glass, vitiated air, ordinary dirt, etc. The window on your burner is quartz and if kept clean will deliver the ray as intended. Always clean the window before beginning treatment.

The high frequency current is an alternating current, so named because of its rapidity in frequency or oscillations. For years it has been known to medical men that an alternating current, when applied to human tissue under a frequency of thirty thousand alternations a second, would contract and irritate human muscle and other tissue and produce a stimulating, tetanic, and ultimately temporary fatigue, resulting in injury. Such a current has little or no indication in medicine. The problem has been to produce a high oscillating current, sufficient in its rapidity to be applied to human tissue without causing such stimulating effects. The high frequency current, as developed today, is the answer to the problem with its frequency of oscillations as high as two and one-half million per second. A high frequency current is therefore an alternating current, raised by proper mechanical devices to oscillations greater than thirty thousand per second, creating a frequency beyond which human tissue does not respond by contracting and which does not irritate. In the D'Arsonval diathermia current, the voltage, the amperage, and the frequency, determine the type of current. There is in the D'Arsonval current high amperage, high frequency, and comparatively low voltage; while the Oudin and Tesla currents carry high voltage, high frequency, and comparatively low amperage.

Heat, as used in medical treatment, is of three varieties—conductive, convective, and conversive. Conductive heat, exemplified by the hot water bottle or electric pad is surface heat applied by contact. This heat dilates the vessels and heats the tissues by contiguity and perhaps soothes the nerves in the reflex path but has little or no power of penetration, the blood stream carrying away the increased temperature practically as rapidly as it is produced. Convective heat, that type delivered to points desired, from some noncontact source, such as the radiant light, hot air, etc., acts practically as the previous type. Conversive heat, under which heading falls diathermia and its modifications, as suggested by the name, is heat produced by energy conversion at the

point of application. As the high frequency current passes from one electrode to another the tissue of the area traversed offers a resistance. It is this resistance to the passage of the current that creates the heat. In other words, the electrical energy attempting to pass is transformed into heat by resistance. Hence this is internal tissue and cellular heat, including not one portion of cells heated but all portions in the path traversed. The rule follows, the greater the resistance, the less rapid the conversion but the greater the heat, the longer the retention.

Heat is sedative, it dilates, it determines a greater blood supply. A greater blood supply means more oxygen, and oxidation means increased metabolism, changed chemistry, removal of waste and accumulated products together with carbon dioxide. This carbon dioxide in turn increases respiration, causing deeper breathing, and again, more oxygen—the process indefinitely repeating itself. Add to this a very fine cellular massage produced under the high frequency current which stimulates and invigorates and the picture of diathermic action is complete. One needs but close the eyes to have a host of physical ailments parading. In fact, any impaired physiology which does not have undrained pus or a danger of hemorrhage as contra-indications can be treated and improved by conversive heat. An undrained abcess can readily be disseminated into the blood stream and contiguous tissues by too great dilation of blood vessels and massage, likewise a hemorrhage could readily be induced, tuberculous cavities could be produced, etc. Many of these conditions are treated symptomatically and others are treated for causative effects, in fact the same treatment on the same portion of the body can be of either nature. Synovitis of the knee is greatly relieved by diathermia, whether the etiological factor be local or general, traumatic or infective. In the traumatic type, a curative end is expected, and in the infective, the focus of infection must be sought and eradicated. Here, of course, treatment is symptomatic. This point illustrates once more the point of beginning contention that success in physiotherapy, as in all medicines, depends solely upon diagnosis and institution of proper treatment dictated by that diagnosis.

In conducting the charge from machine to the patient, care must be ever dominant to protect the patient. Insulated wires and tight contact of these wires with current poles and electrodes suffice for conduction. Their inspection and accuracy must of necessity become second nature and never be taken for granted. Loose connections and poor insulation easily produce burns. The electrodes used may be of several materials, the one used most universally and most satisfactorily for diathermia is the block tin, usually of twenty-two gauge. This is malleable, easily cut to the proper size and shape, can be applied and moulded to the part with facility, and is a good conductor and not difficult to hold in place. Fixation and complete electrode contact with skin surface is no less important than current supply, and for the comfort of the patient and efficiency of the treatment must be one hundred per cent contacted. Sensations of pricking, burning, and concentration of current, result if this important essential is overlooked. Contact is facilitated by properly made electrodes with rounded corners and edges. The application may be greatly enhanced by moistening both the skin and the electrode with lather, although this is not absolutely necessary if the electrode is properly moulded and contacted, and the current increase is a gradual one. For the beginner, however, the lather method is perhaps the safest. Strength of current is determined by tolerance of the patient. Too much heat will burn; the patient will register this and offer protest. Caution here must be inserted relative to this dictum, for obviously, in patients with sensory impairment or paralysis, great care must be exercised, as sensations are lacking and consequently no registration of heat is recorded. Rather not use conversive heat than to produce a burn, as healing is extremely slow in these impoverished conditions and greatly disappointing to the patient.

Electrodes can easily be held in place by straps, elastic bandages, sand bags, etc.

Time of treatment varies with parts treated and type of lesion; but in no instance, with direct diathermia, should treatment consume less than thirty minutes. This is more essential if the maximum charge is reached gradually and reduced gradually.

The size of the electrodes determines the heat concentration. Equal sized plates disseminate heat equally, all tissues beneath reaching the same temperature. Concentration at any point is obtained by varying the size of electrode, placing a smaller electrode near the point where heat is desired. If a plate and a needle point are used, the concentration is determined at the needle point and the heat generated is sufficiently great to coagulate and destroy. This is called surgical diathermia or electro coagulation. Diathermia is heat applied to physiological limits, while electrocoagulation is heat applied to a point of tissue destruction.

Disease syndromes and pathological conditions amenable to diathermia, as determined by accumulative experiences and successful end results, could here be recorded; but for sake of an understanding and more clear indication, let the application of diathermia in all of its modifications be applied only after diagnosis has indicated that heat and heat action will be of benefit. This is the indication, and when intelligently and scientifically applied will direct its use in many daily problems.

The sinusoidal current is a current with a constantly changing polarity, beginning at a zero charge and increasing to maximum strength, falling again to a zero charge, returning to maximum and back again to zero, in one complete change of polarity or in one cycle, thus describing two arcs of equal intensity and equal duration in its passage, one in the positive phase and one in the negative phase. Thus in treating tissue, contractions will follow applications of the current—one contraction will occur in the positive phase and the other in the negative phase with a definite balancing of polarity action, completely eliminating polarity changes by neutralization. Likewise because of gradual current intensity from zero to maximum and maximum to zero, the response of muscles is produced at maximum or near maximum, a contraction is followed by relaxation and relaxation by contraction ad infinitum as desired. By mechanical attachments and arrangements, the number of contractions per minute is mathematically controlled and normal muscle action simulated.

The function of muscles, their physiology and the importance of normal tone and activity are too well known to need elaboration. Everywhere in the human body striped and unstriped musculature maintain important functions in creating energy and motion, giving locomotion, equilibrium and driving power to the various activities. Should the muscle fail to perform, the activities of production fail. Here, then, in impaired muscle physiology, is the Sinusoidal current indicated. The application of this current is obtained through conducting wires from the source of supply and electrodes to the patient. What has been said of conducting wires in relation to the high frequency current applies here with equal degrees of care and attention. The electrodes in this instance, are not naked metals, the metal acting only as the base which must be surrounded by some material capable of retaining moisture and at the same time permitting of good conduction. Many electrodes of this type are applicable, viz., sponges, clay, asbestos, gauze, cotton, etc. The asbestos type in most instances is the choice of selection, but if required can readily be substituted by one or another that fulfills the particular purpose more satisfactorily.

Time of application must be governed by judgment gained by both theory and experience, as in impaired and paralyzed muscles too great intensity of current and too long application will defeat the very purpose sought. It is a common, well known law of muscle physiology, that over stimulation produces fatigue and temporary paralysis.

Frequency of application also must be dependent upon what has just been said; but, in general, the nearer the approach to paralysis the more delicate the judgment needed, and the less deviation from normal physiology the more frequent may be the treatment. These points may be illustrated in the first instance by Volkman's paralysis wherein blood supply, pressure necrosis, strangulation, and non-use have served to create near paralysis; while constipation due to atomy of the bowel musculature, wherein peristalic movements are not properly and normally conducted, exemplifies the second instance.

Should the nerve supply to the muscle be at fault the galvanic current must serve as the choice of treatment selected. This current is a distinct polarity current and has polarity action. The galvanic current is an undirectional, direct, constant current passing always in the same direction from the positive to the negative pole, never reversing itself.

By polarity action is meant chemical changes produced in living tissues because of definite properties possessed by the positive and negative poles of the passing galvanic current. Limitation of space prevents recording here those underlying principles of physics which determine these properties. These are worthy of a separate treatise in themselves. It must suffice only to record those properties whose indication will be available for use.

The positive pole produces changes that determine an increase in oxygen, an increased power of vascular constriction, that sedates, that changes the fluid to an acid reaction and if carried far enough that dehydrates and hardens. Practically the opposite changes are found at the negative pole: increase in hydrogen, vascular dilation, irritation, change of fluid reaction to alkalinity, and in greater reaction liquifies and softens. In passing, the current also creates tissue heat and exhibits the ability to contract muscles.

Electrodes for galvanic treatment are selected according to results attempted. If chemical changes are desired, proper metal electrodes, and those with absorbent qualities to retain medication, are indicated, to prevent chemical decomposition. If mechanical effects alone are desired, the absorbent electrode suffices.

From ten to twenty minutes usually is required to produce effects.

Milliamperage is dependent upon the patient's susceptibility and end results in view. Two to twenty milliamperes is in most cases all that is required. In applying the current in galvanism, extra precaution must be exerted to prevent too rapid arrival at maximum strength and too rapid reduction to zero. Nowhere in physiotherapy is delicate operation more necessary. Electrical shocks, tingling, and burns will result if strict adherence is not maintained.

SUMMARY.

To recaptiulate. First: Physiotherapy is a definite aid to the surgeon and internist in the treatment of disease.

Second: By its proper use, physiotherapy has been elevated to a plane beyond destructive criticism.

Third: Physiotherapy is not a cure-all. Its application has definite indications and when these indications are dictated by proper diagnosis, end results are gained as desired; but as in all branches of medicine, diagnosis must predicate treatment indication.

Electrical Currents In Living Tissues*

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THE modern problem which should concern medical men today, is the application of electricity to medicine. Many of us will be surprised to learn that the origin of such a problem, although of modern significance and of modern issue, can be dated back at least to the time of John Wesley who, upon the suggestion to the medical profession of that age that electricity might be of value in the treatment of disease, was notified that *his* duty was to save souls—"let *us* take care of the body."

It was not until the discovery of the x ray that electricity found its universal application in medicine. With the analysis of the position of the x rays in the spectrum, the discovery of the actinic rays, light rays and infrared rays naturally followed. These physical elements continually surround us and have a great influence upon the human organism. It is my desire in this brief discussion to relate these elements of the physical world to the human body, particularly from the standpoint of the physiologist and anatomist.

Let us begin with the simplest of chemical elements, sodium chloride, NaCl, yet even here we are dealing with mystery. There is not a man living who can tell why an atom of sodium joins with an atom of chlorine; nor the nature of the bond that binds the two as one. No one knows the fundamentals of electricity, any better than the final word about life is known. But let us return to our original, simple illustration. Were we to take a pail, and fill it with water, then drop a little of this sodium chloride into it, it would immediately dissolve by breaking up into particles so fine that they become invisible to the human eye. Immersing a negative electrical pole into one border of the liquid and a positive pole into the opposite border, I find that as it dissolved it has done a very curious thing. It has become divided into two parts, Na and Cl, the sodium accumulating at the positive pole, the chlorine at the negative pole. For this reason, it is assumed that the original salt was composed of two electrically potential substances which were divided by the electrical current into their respective parts, the negatively charged substance migrating to the positive pole and the positively charged substance going to the negative pole. These are called ions and the power of attraction a charge. That curious thing is electricity. The water, HOH, can likewise be broken into its component parts, a positive H ion, and a negative OH ion.

When the sodium ion, Na, which originally was electropositive, upon attachment to the electrically negative pole, loses its charge, it goes around looking for something to hitch onto, and chooses the ion of the water molecule bearing the opposite sign, OH, thereby becoming NaOH. In the same manner, the chlorine ion, Cl, losing its negative charge at the electrically positive pole, becomes attached to the negative water ion, H, forming hydrochloric acid, HCl. That has seemed perfectly simple; but it represents the most fundamental part of electricity.

Consider a step higher, the accumulation of these electrical charges. For this an electrical apparatus called a condenser is used. Take a plain pane of glass, and on one side put some tin foil. Cover the opposite side in the same manner. Connect one side to a battery and the other side to the ground. Each side of this apparatus gets a charge, and of course they are of opposite action. This apparatus is called a Leyden jar.

Apply these conditions to those that go on continuously within the human body. Consider first the blood vascular system. Here the center of action is the heart, which by its contraction forces the blood along the arteries, through the capillaries into the veins. Along the veins are valves which check the back flow. In the heart action itself, what is the stimulus that causes this activity? Physiological experiments show that this contraction wave that passes over the heart muscle from the auricles to the ventricles, as can be shown by galvanometer deflection, is electrical in nature and has its origin from a stimulus from a highly irritable tissue, the sino-auricular node. The sino-auricular node is controlled by nervous impulses.

This brings us to another system in the human organism, the nervous system. The elementary structure consists of the cell body with its nucleus, nucleolus, polar bodies and dendrites, and the axis cylinder, with its collaterals. Down this nerve trunk, an electrical stimulus passes. This can be proven by the insertion of a galvanometer into the path of this current. The deflection of the needle will be in the direction opposite to the cell body, whether it be a motor cell located in the cortex or a sensory cell located in the spinal cord, excepting, of course, the preganglionic neuron of the sympathetic system. The direction of this electrical current can not be reversed. It continues down, breaking into a number of little branches, until it comes into direct contact with another nerve or neuron. The junction with this other neuron is an electrical one way connection called a synapse.

Consider the lung, the vital portion of which is the alveolus where the exchange of gases takes place. On one side of this small alveolar membrane is air, containing a large percentage of oxygen, and on the other side is the waste gases of the body brought by the blood stream, containing a large percentage of carbon dioxide. An exchange takes place, the carbon dioxide of the blood passing to the external surface and the oxygen passing through to the internal surface of the blood stream. Each individual alveolus acts as a condenser.

In the process of cell division, there is a splitting of the cellular elements, and a migration of one portion of

*Given at Omaha, November 3, 1924.

these elements to the surface as polar bodies. The appearance of the spindle, the separation of individual chromatin elements, the migration of one group of these elements to the surface of the cell body, are all acts resulting from some unknown inherent force.

Let us consider the anatomy of the body for a few minutes. John Hunter was one of the greatest anatomists England produced. He spent most of his time on the problem on muscles. You have looked at your muscles and have seen your arm jerk when you move it, and have wondered at the cause. When we understand muscle and know the physiology of muscle, we will understand fifty-eight per cent of our body and we will have solved the great problem of life. But we, in the treatment of these muscular disorders with our electrical means, must constantly keep in mind the nervous impulses that are continually bombarding the muscle, and instruct and encourage the patient to aid us by exerting muscular effort. This muscular effort is the result of nerve or electrical stimuli created in the nerve cells.

As it is with the muscular structures, so it is with every other portion of our body. We exist as a united organism because of the tremendous interlacing of these electrical stimuli, originating from the nerve cell and acting in co-ordination upon the various organs of the body, in response to other electrical stimuli caused by external forces acting upon the terminal endings in the receptive centers. Our body is an electrical machine, with five cables of wires coming into this machine transmitting the impulses of smell, touch, taste, sight and hearing; and a myriad of wires combined in one large cable and contained in the spinal cord which together with the cranial nerves control our response to these external forces.

CASE REPORTS

Schlatter's Disease*

WM. SLATER GREENLEAF, M. D.

Atlantic, Iowa.

HISTORY:—Boy, fourteen years of age. About a year ago, he had a slight injury to the left leg, just below the knee. It caused him to limp for a few days, but after that caused him practically no trouble for several months. There would be periods of a few days or a week, when the limb would be sore and would cause him to limp; but during the last two months, the condition has been a little worse than previous and has been constantly sore.

EXAMINATION:—*Physical examination* reveals a slight swelling of the left leg just below the patella. There is a slight tenderness on pressure but this is not marked.

X ray examination shows a separation of the anterior portion of the upper epiphysis of the tibia at the site of the insertion of the prepatellar tendon together with a slight new bone formation at the same location.

DIAGNOSIS:—Taking all evidence into consideration, we are forced to conclude that the condition is that of Schlatter's disease.

Fig. 1—Lateral view of normal knee. Note the contour of the tibial epiphysis and the width of the epiphyseal line at the anterior margin.

Fig. 2—Lateral view of affected knee of the same patient. Note the contour of the tibial epiphysis and widening of the epiphyseal line on the anterior surface.

*Received for publication Oct. 15, 1924.

EDITORIAL

The Congress of Russian Roentgenologists and Radiologists.

AFTER an interval of eight years, caused by the world war and revolution, a new Congress of Russian Roentgenologists and Radiologists of the Soviet Confederation, assembled in May, 1924, under the presidentship of M. I. Nemenow.

The Congress was opened in Moscow, the 7th of May and was held during the 7, 8, and 9th of May, after which the entire complement went over to Lenigrad, where the session took place during the 11, 12, 13, and 14th of May in the State Institute of Roentgenology and Radiology. A great number met at the assembly, of which at least 273 were active members, and there were many guests. A considerable part of the reports that were made, 38 in number, belonged to the State of Roentgenology and Radiology.

The Congress met with great eagerness, indicating the great development of interest concerning roentgenology in Russia, that has been advancing so rapidly recently.

The principal questions included in the program and discussed during the session of the Congress are as follows:

I. Newest Method of Building Artificial Contrasts, (Pneumoperitoneum, Encephalo and Ventriculography, Pneumoperinephrography, Contrast Roentgenography of the Bronchi, etc.). Reports were delivered by M. I. Nemenow and sub-reports by D. T. Boudinoff, S. A. Tchougounoff, V. N. Rosanoff, V. V. Ossinsky, and others; the report of S. A. Reinberg and J. B. Kaplan, from the State Institute, considered the Peristaltic Reduction of the Bronchial Muscles.

II. Roentgenotherapy of Malignant Formations. The report of S. R. Fraenkel on the Roentgenotherapy of All Malignant Tumors Except the Gynecological Tumors, together with the reports of M. I. Nemenow on the Roentgenotherapy of Malignant Gynecological Tumors and the Roentgenotherapy of Seminomes, (the latter having been experimented in 15 cases), aided by the many other reports, admirably covered this particular field.

III. Roentgenodiagnosis of the Surgical Diseases of the Lungs. The report of A. A. Zeitlin, S. A. Reinberg and others were enjoyed.

IV. Roentgenodiagnosis of Rare Diseases of the Skeleton—Diseases of Kohler, Pertes, Osgood-Schlatter, Chondrodistrophia, etc. The reports included those of S. A. Reinberg, L. L. Holst, and others.

V. Roentgenodiagnosis of Lung Tuberculosis by S. A. Reinburg.

VI. Photo and Radiotherapy of the Lung and Peripheral Tuberculosis by R. J. Gassul.

VII. Roentgenography of the Blood Vascular System by S. A. Reinburg and A. S. Solotouchine.

VIII. Roentgenotherapy of Scabs, Trichophity, Lupus, Sycose, and Other Skin Diseases by Y. G. Liberson.

We must also point out a list of brilliant experimental works, presented to the Congress:

I. Experimental Cancer—printed in the Russian edition of Annales de Roentgenologie et Radiologie.—G. V. Shor.

II. Combined Effect of Radium and Chemical Reagents, Copper Salts, on Plants.—G. A. Nadson.

III. Influence of Roentgenization of the Stomach on Its Secretion.—Anna Jugenbourg.

(All of these experiments were carried on at the State Institute of Roentgenology and Radiology.)

IV. The work of Dr. Leinberg of the Kharkoff Roentgen Academy, on the Roentgenodiagnosis of Appendiceal Disease, a methodically fulfilled precious work, was accompanied by a series of brilliant roentgenograms.

The question concerning the work of roentgenologists called forth a lively debate as to the efficacy of formerly existing measures to prevent the evil effects of roentgen rays. Considering this question, and a whole quantity of others, the Congress adopted a series of resolutions that are of international importance. In the resolution concerning work, protection is included and among other things the following requests:

1. That each doctor must be provided in the roentgenodiagnostic cabinet, in addition to an apron, spectacles, and gloves, with a protection wall about one or one and one-half archines high, made of sheet lead 3 mm. thick, and a screen with a lead glass, reckoning the protecting space not less than 30.40 cm.

2. That in a roentgenotherapy cabinet, with a capacity of 150 kilovolts, a protecting cabinet for the operator is indispensible. If there is a greater capacity than 150 kilovolts, there must be a settlement consisting of three partitions, one for the generators, a second for the patients, and a third for the operator.

3. That the day for the roentgen operator is to consist of four working hours, and five working days during the week.

4. That roentgen operators must be paid a 50 per cent compensation for harm and profit every year, including the two months holiday, and undergo a general physical examination at regular intervals.

5. Concerning the teaching of roentgenology in the high school, the Congress postulated the absolute necessity for teaching and studying roentgenology in the territories of the Soviet Confederation, and fixed an indispensible minimum of roentgen knowledge for the doctor.

The Congress reconstructed the Federative Association of Roentgenologists and Radiologists, to which all the pre-existing societies of roentgenologists and radiologists of the Soviet Confederation joined.

The Congress elected Prof. M. I. Nemenow president of the association. The review, Annales de Roentgenologie et Radiologie, that used to be published as the journal of the State Institute of Roentgenology and Radiology,

now became the official journal of the Confederative Association and Roentgen Institute.

The next Congress was appointed for May, 1925, to be held in Lenigrad.

President Nemenow decided to apply through Professor Forssell of Stockholm, to all foreign roentgenologists with the proposal to form an International Association of Rentgenologists and Radiologists, that will prepare for the convocation of the First International Congress.

T. Oxionof.

Index Radiologorum—Invitation.

AN invitation for the foundation of the Index Radiologorum, an international register of radiologists and electrologists, is herein extended.

The radiologists, as the representatives of other branches of science, need a close alliance among themselves. The rapid course of development which the researches in Radiology and Electrology uninterruptedly pursue, necessitate mutual co-operation, and the ensuring of strong support both scientifically and socially.

The Index Radiologorum is designed to be not only a register of addresses, but aims at high usefulness:

—it will throw light on the achievements of radiology in the various countries in the form of a larger number of valuable original contributions;

—it will become a guide to the academical centers of medical radiology;

—it will regulate the insurances of radiologists on an international basis;

—it will assist talent and provide stipends for meritorious men of this profession;

—it intends to support families of radiologists, fighting the battle of life; and last but not least,

—it is destined, according to the excellent proposal of Dr. Regaud, to help to facilitate the exchange of literature between the radiologists of the entire world.

The fund which is to be created from the produce of the sales of the Index volumes, the advertisements and the subscriptions, will in the beginning probably yield only modest means with which to carry on the numerous plans above enumerated. Later these means will surely grow, as only the running expenses and those of the administration are to be met—personal gain being strictly excluded.

The administration and application of the fund will be under the supervision of the grand committee of the authors and protectors, who in response to the invitation of the founders, act as the representatives of the various countries. They will be assisted by trustees.

For the present, the principal object in view is to make it possible for all radiologists to become members of the International Index.

Every medical man, be he a radiologist by his principal or his secondary calling, is kindly requested to enter his name in one of the lists, which will soon be propagated as an enclosure in the medical journals under the title, Index Radiologorum, and to send in the subscription with the fee therein, which is to be kept as low as possible.

The larger the number of subscribers the larger the means will be from which the Index will operate.

The founder and editor of the Index Radiologorum:
Dr. Wetterer, Mannheim, Germany.
Author of the Handbuch der Rontgen und Radiumtherapie.

ABSTRACTS and REVIEWS

Tarsal Scaphoiditis. Louis C. Shroeder, M. D., New York City. Amer. Journ. of Dis. of Child. 28: 293, Sept., 1924.

TARSAL SCAPHODITIS is a comparatively rare disease occurring in children between the ages of four and nine years. The symptomology and course is practically the same in all cases, and the cause is usually attributed to repeated slight trauma to a delayed ossifying center. Diagnosis of this condition cannot be made without a roentgen ray examination. The treatment is immobilization in a plaster cast and the prognosis is excellent.

Case of Syringomyelia Treated with X Rays Twenty Years Ago. Bèclére Bull. et mém. Soc. Méd. d. hôp. d. Par. 6:641, 1924.

IT is the opinion of the author that it is best to spread x ray treatment over a period of days, weeks or years. The dosage is to be determined and prorated. To substiantiate this statement, a case of syringomyelia was cited in which excellent results covering a period of twenty years were obtained by means of repeated doses of slightly penetrating and unfiltered rays. Regardless of the wonderful results that have been obtained by the physical and deep-therapy treatments, the author looks upon this branch of medicine as still occupying the experimental stage.

Roentgen Ray Treatment of Syringomyelia. Report of One Case. A. S. Merrill, M. D., Asst. Roentgenologist, Mass. General Hospital., Am. J. Roentgenol. 12:214-217, August, 1924.

SYRINGOMYELIA is described as a condition characterized by muscular wasting of the Aran-Duchenne type, loss of thermic and painful sensations and preservation of tactile sensibility. The nature of the underlying pathology cannot be determined during life, but the lesion appears, on autopsy, to have a predilection for the grey matter, especially the posterior portion of the dorsal horns, but frequently involves the white matter. Its distinguishing features are asymmetry and irregularity. The lesions are generally accepted as due to a primary hyperplasia of neuroglia followed by a degenerative softening and cavity formation. Working on the theory that (1) the gliosis and possibly other formations

may be due to a neoplastic proliferation of cells of the embryonic type, and that such cells show a susceptibility to radiation, deep roentgen therapy has been attempted for its treatment; (2) as no other form of treatment seems to change the course or progress of the disease, roentgen radiation is advisable. The results obtained in the case reported appear to confirm this theory.

Experimental Studies Upon The Lethal Doses of X Rays and Radium for Human and Other Tumors. S. Russ. D. Sc., F. Inst. P., Middlesex Hosp., Eng., Brit. Jour. of Radiol. 29:275, Aug., 1924.

TO use the author's own definition "the lethal dose is that dose which is necessary to give tumor tissue in order to prevent its growth when it is inoculated into normal susceptible animals." His animal experimentation shows that in a tumor mass the individual cells possess a widely different vulnerability, some of them being much more resistant than others. Selecting a tumor that has been given a fairly big dose of x radiation, it always grows much more slowly than the original tumor. It has been possible to reduce the normal rate of growth to one-fourth or one-fifth of this rate without any appreciable modifications of the tumor being observable. In discussing this acquired resistance to x rays after repeated doses of x radiation, it must be remembered that any specification of lethal doses for tumors in terms of the skin dose is intimately bound up with the differential action which exists for x rays of various wave lengths.

In converting this animal experimental data to human tumors, the author decided to employ a factor of safety, although his previous observations showed no very wide difference between the lethal dose required for human tumors and that required for animal tumors, so he gave the human tumor twice that dose which was found lethal for animal tumors. In none of these cases was any growth of the irradiated tissue observed.

Using Jensen's rat sarcoma and substituting radium tubes, such as are in ordinary clinical use, experiments were made to determine the lethal dose of tumor cells. "The most noticeable feature of the result was the comparatively small distance to which the lethal action extends from these tubes, even when the exposure continues for several days. There is a fairly rapid drop in the intensity of the radiation as one gets further away from the tubes, but, when allowance is made for this, it appears from the results that the time of exposure has to be proportionally lengthened in order to get the same effect." Diagrams of the radium radiation intensity curves are included in the discussion.

The effect of radiation upon the resistance of the host was an increase in the body weight of the irradiated animals and simultaneously an increase in their resistance to the growth of tumors. It is therefore questionable whether it might not be useful in radiotherapy to supplement the direct irradiation of the tumor by a generalized radiation of the body; this radiation should be weak in intensity and repeated at intervals over fairly long periods.

The Theory of Hydrogen Ion Concentration in Relation to the Action of Direct Continuous Currents and Other Forms of Current Electricity. W. J. Turrell, M. D., Am. J. Electroth. & Radiol. 12: 302-306, August, 1924.

DOCTOR TERRELL sums up his paper in the following words: Current electricity in its slowly interrupted form exercises a stimulating action on the cells in the path of the current, the excitation of concentration being a manifestation of this stimulation. Both this stimulation and the contraction are the result of hydrogen and hydroxl ion concentration. By greatly increasing the rate of interruption we are able to annul the effects of this hydrogen and hydroxl ion concentration and so are enabled to produce any desired degree of heat in the tissues with a complete absence of chemical stimulation. In addition to this heating effect, the kinetec action which produced it has a valuable influence in accelerating diffusion through the tissue membranes. The action of the constant current depends upon its stimulating effects and reflex irritation at the poles, on the heat it generates and the diffusion it facilitates in its deeper interpolar path.

A Practical Method of Constantly Measuring the Radiation From a Roentgen Tube With a Check Against the Omission of Filters. J. L. Weatherwax, M. A., and E. T. Leddy, M. D., Philadelphia Gen. Hosp. Am. J. Roentgenol 12:271-279, Sept., 1924.

WITH an abundance of graphs and illustrations, the authors show that a simple device, rather inexpensive, can be constructed to measure continuously the roentgen radiation after passing through a filter, enabling one to observe the constancy of the radiation from a roentgen ray tube.

The galvanometer ionization system gives the number of milliampereminutes to produce an erythema with different filters after certain calibrations have been made. Examples of the method of making these calibrations are given in the substance of the article. The satisfaction of having a constant, continuous reading of the quantity of roentgenogram radiation while treating is worth the trouble of calibration.

A Universal Clamp for Holding and Adjusting Electrodes of Any Kind for Any Purpose. Victor Cox Pedersen, A. M., M. D., F. A. C. S., New York City, Am. J. Electroth & Radiol., 62:337-340, Sept., 1924.

THE author presents a complete description, accompanied by illustrations, of a universal clamp so designed and modeled as to hold electrodes of any kind for any purpose. The clamp has three points or joints of rotation through 360 degrees, and two points or joints of rotation through a little more than 180 degrees. The clamp folds upon itself within a total length of 12 inches and extends to a length of 28 inches.

Certain Clinical and Radiological Notes on the Semiology of the Heart in a Case of Dilatation and Expansion of the Right Auricle. J. Montes Pareja, M. D., and P. A. Barcia, M. D. From the Transactions of the Section on Medicine of the Third Scientific Pan-American Congress Held at Lima, 1924.

THIS is a monograph of 31 pages and 22 figures which reports a case in detail, giving the roentenological findings and postmortem findings.

Some Observations on Short Wave Roentgen Therapy. GEORGE W. HOLMES, M. D., and RICHARD DRESSER, M. D., Roentgen Laboratory, Mass. General Hospital., Boston, Mass., Am. J. Roentgenol. 12:209-213, August, 1924.

THE authors outline their technique of operation, the organization of the treatment clinic, and cite a few of the immediate results obtained. The machine used is of the so-called "booster" type, in which the current is rectified at a comparatively low voltage, and is then stepped up by means of two auxiliary transformers. No sound proof room is necessary. By means of a high tension switch, the booster transformers may be cut out of the circuit, and the machine used for low voltage treatment, or even roentgenographic work if necessary. Although the machine delivers a slightly low intensity for a given voltage, the wave length and depth dose are practically the same as that obtained with installations that rectify at the full voltage.

"The tube was placed in a lead lined couch which had an opening in the top and another in the side from which a small cone projected. The small projecting side cone allows easy access to neck and axillary regions. The size of the fields, at the top and side, is regulated by lead diaphragms, the openings in these diaphragms are of standard sizes—10 by 10, 15 by 15, 15 by 20, and 20 by 20 c. m. Between the patient and the diaphragm is placed a celluloid plate 4 mm. thick. This prevents the patient's sinking into the opening, and cuts off any secondary radiation from the lead. The distance from the target of the tube to the celluloid plate is exactly 50 cm. both top and side. Without altering the direction of the target of the tube, the lateral beam was measured and no difference was noted in intensity between the direct and lateral beams. The wave length and depth dose was the same in both cases. By this method two patients could be treated simultaneously. The advantages of this type of installation are obvious: (1) the couch encloses all of the high tension current; (2) there is absolute protection from electrical shock and undesirable scattered radiation without subjecting the patient to the discomfort of the leaded rubber covering; (3) radiation sickness is diminished since the treatment is free from noxious gases and odors; (4) the control cabinet being placed behind a leaded wall, the operator is safe from secondary radiation arising from the patient's body.

The machine is operated at 200 kv. (spark gap), 4 ma., 50 cm. focal skin distance, 0.5 mm. copper plus 2 mm. aluminum filter. This setting with the average tube gives an effective wave length of 0.155 A, and a depth dose of 35 per cent at 10 cm. when a large (20 by 20) field is used. The dose compares very well with recent observations made on other installations by Glasser, who measured 34.5 per cent with the same setting. With a well broken in tube, the intensity delivered under the above conditions is 0.148 E. S. U. measured without the patient on the table. A mild erythema is obtained by 800 E. S. U. seconds (measured without the patient). This makes the erythema time, using a large field, 90 min. The increase in surface dose due to the scattering and secondary radiation is 35 per cent, making a total of 1080 E. S. U. seconds actually received by the skin when the patient is given a full erythema dose..... It has been our practice to check up our machine every morning with the Duane galvanometer, adjusting the milliamperage and voltage so that we get an intensity of 0.148 E. S. U. and an effective wave length of 0.155A. This keeps the time of treatment constant ..... In using various ground and measuring filters, supposedly of the same thickness, and all obtained from reliable roentgen ray firms, we found some little difference in both wave length and intensity. This led us to measure our filters with a micrometer, and we found that they varied in thickness not only with one another, but different parts of the same filter showed slight variations. To obtain the average thickness, we used the weight, area and density formula,

$$\frac{\text{weight in grams}}{\text{area in sq. cm.} \times \text{density}} = \text{thickness}$$

This showed that our copper filters ranged from 0.48 to 0.53 mm. in thickness, although they were all represented as being 0.50 mm. In an endeavor to obtain the most effective setting for our machine, we performed the following experiment: Keeping the filtration, milliamperage, and distance constant, the kilovoltage was lowered from 200 to 120, ten points at a time, the effective wave length and intensity being measured with the electroscope at each drop."

The treatment that is suggested by the authors consists in extending the total time of radiation over a period from ten days to two weeks. One-half an erythema dose was given at a sitting, repeating this every day or every other day until the series is finished. "As a rule we are still treating the superficial glandular manifestations with the longer wave therapy (4 mm. Al filtration) using the short waves on only the mediastinal and abdominal processes. Mediastinal symptoms are in most cases controlled by about one-half an erythema dose over the front and back of the chest, using a large sized field. In some of the first cases treated, we gave this one-half erythema dose in one treatment. Several of the patients stood this very well, but there were a number of very severe reactions, one of them proving almost fatal. At present we seldom give more than one-sixth of an erythema dose at a sitting when treating a case of Hodgkin's disease over the mediastinum or abdomen. The total dose is the same in most cases, but its administration is spread over a longer period. With this technique we get very little roentgen sickness, and the neoplasm disappears as quickly."

Practical Aspects of Certain Phases of Treatment with Special Reference to Organotherapy and Physiotherapy. GEORGE B. EUSTERMAN, M. D., Ohio, M. J., 20:677-680, November, 1924.

PHYSIOTHERAPY is the treatment of disease by the application of massage, heat, light, water, and certain forms of electric current. In a comprehensive sense x ray and radium may be included. It has been the basis of the successful treatment of chronic diseases abroad and has been a potent factor in curtailing quackery. Physiotherapy is rapidly becoming recognized in this country, as is evidenced by its introduction into the curriculum of the Navy Medical School and in Harvard. Economically, this mode of treatment has become very important. In Europe, the shortening of convalescence from accidents has reduced workmen's com-

pensation from 10 to 30 per cent, in which physiotherapy followed or was coincident with the usual surgical procedures.

In discussing radiotherapy, actinotherapy, and thermotherapy, the author states that in cutaneous lesions and diseases the x ray, radium and the mercury vapor quartz lamp are frequently employed. The choice of the first two agents rests upon the size and accessibility of the lesion, or the individual preference of the operator. X ray treatment is generally recommended for acne, eczema, seborrheic dermatitis, lichen planus, ringworm, favus of the scalp, infectious localized granulomas, and hyperhidrosis, and as a palliative in anal and vulvar pruritis, etc. Partiality to the treatment of acne, plantar, and preiungual warts has been shown x ray. Electrodesiccation is the treatment for the other warts. Cancer of the skin, especially basal cell epithelioma, responds to either x ray or radium, although many authors prefer radium, especially when the disease is on the eyelids, canthi, nasolabial fold, or on the nasal or buccal mucosa. Senile keratosis, especially of the scaly variety, leukoplakia and vascular nevi are especially amenable to radium. In nodular, dense and deep seated lesions, preliminary electrocoagulation is indicated. In the treatment of skin lesions, a thorough knowledge and application of the rays are necessary. A less dangerous method and one more popular with the practitioner is the mercury vapor quartz lamp, which, having a stimulative and bactericidal effect, is employed in the treatment of impetigo contagiosa, pityriasis rosacea, lupus vulgaris, alopecia areata and tricophytosis, also in pyodermia, dermatitis papillaris capiti, certain forms of seborrheic dermatitis, and port wine marks.

The Influence of Ignorance and Neglect on the Incidence and Mortality of Cancer. WILLIAM J. MAYO, M. D., J. Indiana M. A., 17:331-334, October, 1924.

"OUR knowledge of cancer is excellent, so far as it goes. Because we are in doubt as to the exact exciting factor, we should not be too pessimistic. We should not emphasize our failure to learn the exact cause of cancer to the extent of failing to make use of the wealth of knowledge which we possess concerning the disease itself. It is something to know that it is not hereditary in the ordinary sense, although certain families may have certain tissues more subject to chronic irritation than others; but even so it has been shown how quickly this factor has been bred out. It is a comfort to know that cancer is not contagious.

"Elimination of all sources of chronic irritation, early diagnosis, and removal of the growth while it is still local, are the salient points in the prevention and cure of cancer at present.

"The results of modern surgical operation for the removal of cancer can be improved by the use of x ray and radium, in the hand of a competent specialist, especially in the more cellular growths, Grades 3 and 4 of Broder's index of malignancy, in which the surgery alone gives the poorest results. But the men who use x ray and radium, must be 'honest to goodness' specialists, who work with good surgeons, and competent pathologists, and do not belong to that group of self styled specialists who, with a nickel's worth of radium, do a million dollars worth of harm. However, we shall always have with us, through ignorance and neglect, a large group of surgically incurable patients, for whom various agents must be tried; but let us be sure that the application of these more uncertain agencies is limited to the hopeless, instead of adding to that number by the use of half baked and quack methods during the surgically curable stage of the disease. Above all, let us not as a profession, be prejudiced, but keep our minds open to new facts, despite their source; for cancer is a great scourge."

Reduction of Cancer Mortality. G. BETTON MASSEY, M. D., Philadelphia, Clin. Med., 31:538, 1924.

LATE recognition and deferred treatment of cancer growths are the most serious drawbacks to such effective treatments as electrocoagulation, radiation or wide excision. The real valuable signs of cancer in its early and curable stages are: (1) Absence of tenderness or real soreness in a recently discovered nodule is very significant of malignancy if signs of cystic conditions are absent. All inflammatory tumors are tender to the touch—cancers are never either in early or late stages. (2) Absence of pain is invariably characteristic of early cancer nodules except in rare instances when the nodule is confined with a sensory nerve between two bony surfaces. (3) Hardness to the touch is a most important sign of cancer. (4) Visual evidence, small growths, particularly epitheliomas as of the less sensitive regions of the skin may be eradicated and the patient cured in the early stages by any office practitioner who has a high frequency generator or even a simple galvanic battery. X ray and radium are in these cases unnecessarily powerful and there are possibilities of damage even in skilled hands. For the general office practitioner a high frequency generator is a necessary part of his equipment for, although these neoplastic cases may be few, medical diathermy is indicated in patients with any form of chronic inflammatory stasis without abscess formation; in chronic or acute pains in any part of the body, high blood pressure, acute and chronic sprains, etc., and even as an important adjuvant, it is recommended in pneumonia. In these medical applications, diathermy is administered from plate electrodes with the surface areas proportional to the part to be treated and a current supply for each inch capable of heating to simple hyperemia the whole thickness of tissues beneath the electrodes. Concentrations of this energy by use of the electric needle has desiccative and destructive effects that constitute surgical diathermy. In the absence of a high frequency generator, zinc ionization with a home made zinc needle attached to a radio B battery will help to lessen cancer mortality at its most vulnerable point —its earliest stages.

In destroying small skin epitheliomas, desiccation is used which "employs the Oudin current of just sufficient strength to accomplish the purpose with the concentration of an arc of electrons flowing from the sharp point of a fine wire electrode..... kept about an eighth of an inch from the surface of the growth to produce this arc." The patient should be in a dorsal position and a local hypodermic instillation of two per cent procaine should be given around the growth to anesthetize by infiltration. Connect the desiccation electrode to the Oudin current of the high frequency generator, and with the weakest possible current turned on apply

the spray arc. The growth will immediately whiten and the application is continued until desiccation seems complete. A dry dressing is applied after thoroughly cleansing the wound.

In the absence of this high frequency generator, a 22½ volt or 45 volt B radio battery may be used depending upon the size of the epithelioma. If the tops of the cells are accessible, one may use this same step up principle, by connecting the active electrode (needle) to the positive pole, inserting it into the middle of the small growth, pointing towards the periphery, and the negative pad or zinc plate must have two wires, one attached while the second is being used to carry in more current, thereby producing a continuous and increasing current. This will require from 35 to 40 minutes of application. The after treatment is the same as that used for the high frequency application.

Diathermy in Urology. H. W. E. WALTHER, M. D., and C. L. PEACOCK, M. D., J. A. M. A., 83:1142-1147, October 11, 1924.

DIATHERMY is the production of heat within the tissues of the body between two electrodes of a high frequency machine, due to the resistance encountered by the passing of an electric current through living cells of the body, from one electrode to another. Diathermy may be either surgical or medical. Surgical diathermy, or electrocoagulation, is simply a cooking process obtained by placing one large electrode on some part of the body foreign to the part to be treated, and a smaller electrode on the part to be destroyed. In surgical diathermy, we have an agent for destroying new growths that is bloodless, prompt, clean and accurate; produces no shock; minimizes danger of metastasis and likelihood of recurrence; induces a rapid convalescence, and gives good cosmetic results. Medical diathermy is in turn subdivided into sedative and stimulative, the former alone being applicable to urology. Sedative diathermy produces an active hyperemia, stimulates phagocytosis and revitalizes tissue cells.

In this preliminary report, seventy-three urologic cases are treated by diathermy, either medical or surgical, covering a period of twelve months ending the first of June, 1924. In the series there were eleven cases of bladder tumor, fifteen cases of tumor of the urethra, fifteen lesions of the external genitals (including chancroid, granuloma, and warts), three cases of gonococcal endocervicitis, twenty-five cases of gonococcal epididymitis, one case of orchitis complicating mumps, and three cases of gonococcal arthritis. The experimental treatment of prostatitis and seminal vesiculitis is not included in this report because of the failure to obtain uniform results.

The seventy-three cases of urologic conditions treated with diathermy and reported in the article in abstract form, demonstrate conclusively the value of the procedure.

Effects of X Ray Treatment in Gynecology. Report of a Remarkable Case of Alopecia So Caused. KARL NEUWIRTH, M. D. Paper. Octavo, 142 pages. Published 1919 by Alfred Hoelder, Wien and Leipzig. Price, 90 cents.

THIS is a very extensive and detailed report of a woman patient 40 years of age who received radiotherapy for a carcinoma of the portio vaginalis in whom complete baldness soon resulted, although she had had a wonderful head of hair.

Other such cases have been noted and the literature is thoroughly reviewed.

Sterility—Its Etio'ogy and Some of its Sociological Aspects. M. C. MARTIN, M. D., Kansas M. S., 24: 288-291, October, 1924.

IN his discussion of sterility, the author mentions x ray exposure as a possible cause. He cites, as a case, his own technician who conceived after having been exposed to x ray for a number of years, but became eclamptic. He refers to a statement made by Belot, the Parisian radiologist, that a series of twelve women radiologists, who had each worked with the x ray for from one to nineteen years, produced thereafter from one to seven children each. There are a great number of factors that cause sterility and it will be a very difficult task to single out and prove x ray exposure as a definite causative factor.

Electrocoagulation Versus Operation in Cancer of the Uterus. A. DAVID WILLMOTH, M. D., Kentucky M. J., 22:371-375, October, 1924.

PATIENTS with cancer of the uterus usually present three cardinal symptoms, viz: discharge, hemorrhage and pain—the discharge being the earliest, the hemorrhage the most alarming, and the pain the most unfavorable of the symptoms. Of these, 20 per cent are considered operable, of which some will die from the immediate results of the operation, others from metastasis, so that under present conditions the author's figure for cure is between five and ten per cent.

It is universally agreed that the less trauma that is inflicted upon any cancerous growth, the better the prospects are for the patient. It is with the realization of such facts and the earnest desire on the part of the profession to find a treatment to lessen metastasis, relieve foul discharge and control hemorrhage, that the author considers the facts.

According to the author, it has been conclusively shown that the cancer cell is susceptible to destruction by heat much lower than the normal cell, cancer cells being destroyed at a temperature of 114 F., while the normal cell will resist 140 degrees. The advantages of treating cancer by electrocoagulation from the D'Arsonval current of a high frequency machine is: (a) the application of heat at the moment and point to be treated; (b) the instant the current is broken the applicator is cool, and no burning of the tissues takes place; (c) it heats from the inside toward the outside, and any degree of destruction can be produced depending upon the volume of the current used and the time of application; (d) requires no general anesthesia; (e) the operation is bloodless; (f) there is no shock; (g) the parts are thoroughly sterilized; (h) dangers of metastasis are practically nil because the current reverses the flow of lymph toward the surface, as is evidenced by the free flow of serum from the growth; (i) tumors otherwise inoperable may be made safe for removal, if removal by surgery is later deemed best; (j) the operation is easily and quickly done; (k) postoperative adhesions are rare; (l) rapid convalescence, which in many cases consists of only a few hours in the hospital, no trauma having been inflicted to the growth of surrounding tissues. The only danger from this method is the destruction of important blood vessels and

nerves due to careless, or inexperienced operation.

The patient upon whom the electrocoagulation is to be done should either be given gas, or hyoscine, morphine and cactine. This will render a patient upon whom electrocoagulation is to be done, free from pain and discomfort. The patient is placed upon a table with the limbs flexed, as for vaginal work, and the indifferent electrode of blocked tin, which should be eight or ten inches in size, is placed either in the sacral region or on the abdomen. Before the electrode is placed on the patient the machine should be tested by bringing the operating electrode about one-half inch from the indifferent electrode. When the current is turned on, and the milliameter is observed, it will show a reading of about 400 to 500 milliamperes less than it will show when operating on the patient. The electrode is placed directly against the skin, after the skin has been thoroughly soaped. This makes a better contact and the area covered is so large that no heat will be produced or damage done, provided the electrode has no sharp corners and is kept in direct contact at every point.

The connecting wire must be securely fastened to the plate to prevent its coming loose and producing an arc in which instance a burn will result. The other cord, leading from the active pole of the D'Arsonval current runs to the handle of the instrument. The machine should be grounded to a water pipe to take care of the stray currents, and should be operated by means of a foot switch.

For the work under discussion the author suggests from 1,200 to 2,500 milliamperes, the smaller dose being used anterior near the bladder and posterior near the rectum. On the sides, larger doses should be used. The time is dependent upon the volume of the current, usually about twenty seconds at each insertion of the electrode. The needle should be kept in position until the tissues are blanched, the active electrode not being moved until the current is broken at the foot switch, otherwise a severe burn in the vault of the vagina will be produced. The electrode is inserted into a new area and the process repeated until the entire circumference of the uterus has been treated. No cutting away of the dead and fungus tissue should be done. After twenty-four hours, vaginal douches of formalin, one drachm to half a gallon of water, serves to deodorize and cleanse.

Postoperative treatment consists of the application of actinic rays over the body from the air cooled lamp up to the erythema dose, for its metabolic effect. Rays applied from the water cooled lamp at the site of growth, will aid the healing process, after all secretions have been thoroughly removed. Two applications should be made each week with the open lens at a seven inch distance for one minute.

Treatment of Fibromas of the Uterus and other Causes of Menorrhaga: By Intensive Roentgen Ray Therapy, with Special Reference to the Possible Complication of Malignant Disease. LOUISA MARTINDALE, M. D., J. A. M. A., 83:1057-1060, October 1, 1924.

THERE are two methods of treatment of fibromyomas of the uterus, hysterectomy and roentgen ray irradiation. The deciding factors for the method of treatment are: physical signs, symptoms, actual diagnosis of the case, and the general condition of the patient. In a straightforward uncomplicated case of a fibroid uterus, well under the size of a six months' pregnancy, interstitial rather than subperitoneal, in which the chief symptom is excessive menorrhagia, intensive roentgen ray therapy is the method of choice. In the cases of grave heart disease, in which no surgeon would care to operate, it is essentially justifiable, and the improvement is remarkable.

"In all cases that are at all doubtful in diagnosis, I am certain that an exploratory laparotomy, followed by hysterectomy when necessary, is the only right treatment. Operation for carcinoma of the fundus uteri has such a good prognosis if operation is early, that one cannot be too careful to eliminate the possibility of its existence before undertaking roentgen ray therapy. One has to remember that the roentgen ray dose sufficient to produce climacteric hemorrhage or fibromyoma of the uterus is only approximately one quarter of the dose necessary for carcinoma (viz: 35 or 45, as against 110 per cent of the unit skin dose), so that an error in diagnosis in such a case may be an extremely dangerous one. Carcinoma of the cervix is less likely to be missed, except in those cases in which its origin is in the cervical canal itself."

The chief characteristic of the new technique is precision of dosage. This involves: (1), Knowledge of the exact biologic unit of skin dose of every tube under given conditions. The unit dose is that dose which gives on the eighth day a just discernible erythema of the skin, and on the twenty-eighth day a slight pigmentation. (2), Knowledge of the percentage depth dose of every roentgen ray tube employed under the same standard conditions. The depth dose can be estimated in every case by means of the Volt'z tables. (3), Knowledge (gained by experimentation) of the best filtering for each tube so as to obtain the highest point of homogeneity possible. This is also ascertained by means of mathematical calculation and the use of the iontoquantimeter. . . . . "I work with 5,200 interruptions in my gas break, with an amperage of from 6 to 7 amperes, and a steady 2 milliamperes through my Coolidge tube or boiling water tube. . . . . I have kept in touch with a very large percentage of my patients and have been very much impressed by the apparently beneficial effect of the treatment. They reiterate how well and young they feel, and how improved their general health is, so much so that I have wondered whether any other factor besides the loss of anemia was at work."

A Protective Method of Applying Radium in the Cervix. W. J. WOOLSTON, M. D., and R. C. CRAIN, M. D., J. A. M. A., 83:1429, Nov. 1, 1924.

RADIUM is applied to the cervix in one of three ways: (1) in a screened capsule in the cervical canal; (2) in a screened capsule in the cervical canal, with a second container crosswise resting against the vaginal surface of the cervix for "cross-fire"; (3) by embedding needles into the cervical tissue. The screening of the vagina, bladder, and rectum to protect these surrounding parts from damage, can easily be accomplished by the use of dental impression compound. This the authors have used with success, because of the following advantages: (1) when heated in warm water it can easily be moulded into any thickness and shape; (2) it hardens quickly on cool-

ing; (3) it is of sufficient density to absorb the radiation; (4) it forms a proctective cap over the cervix, thus making sure that the radium cannot be displaced; (5) it is not hard to introduce or remove.

Cancer of the Uterine Cervix, Treated by Irradiation: Methods of Treatment and Results in One Thousand and Twenty-four Cases. HAROLD BAILEY, M. D., and WILLIAM P. HEALY, M. D., J. A. M. A., 83: 1054-1057, Oct. 4, 1924.

THE plan devised by the authors is an intensive cross firing of the lesion and the surrounding pelvic structures from the cervical canal, the vagina and the external surface of the body. This is done by the low voltage roentgen ray machine externally in conjunction with radium which is applied internally.

The duration of the treatment is from seven to ten days for each patient, which means that primary cases on the average receive from 6,000 millicurie hours radium treatment, of the gamma ray type, in and about the cervix, and four roentgen ray applications in that time. The roentgen ray treatments routinely consist of a fifteen minute exposure with a 5 mm. aluminum filter, 12-inch focal distance, 10-inch spark gap, from 90 to 110 kilovolts, and 5 milliamperes of current. The tube is so arranged that the rays converge toward the center of the pelvis, and the areas treated are right and left iliac, anteriorly, and the right and left sacral, posteriorly.

For convenience of discussion, the cases have been grouped in a clinical classification as, (1) primary cervical cancer, (2) recurrent cervical cancer, and (3) postoperative irradiation. Statistics are given as to the number radiated and the results obtained in each case. The authors base their conclusions on the statistics which "emphasize three points in regard to radiation therapy in regard to carcinoma of the cervix: (1) Radiation and the roentgen ray are of extreme value in cases of advanced cancer of the cervix in checking the progress of the disease and relieving distressing symptoms. (2) Patients with recurrent cancer of the cervix can be greatly benefited by the ray therapy, if seen before the lesion is too extensive. (3) Prompt postoperative irradiation is imperative, and to neglect it would seem to be inexcusable."

End Results of Two Hundred and One Cases of Carcinoma of the Cervix. HOWARD C. TAYLOR, M. D., and THOMAS C. PEIGHTAL, M. D., New York City, Am. J. Obst. & Gynec., 8:288-297.

THE authors divide their discussion into two divisions, i. e., advanced cases and early cases. (1) The advanced cases treated by radium alone show much better results than were formerly obtained by any other nonoperative palliative procedure, or by such operative measures as the use of the actual or Percy cautery. The growth locally in the cervix and vaginal walls can be controlled, so that the patient is infinitely more comfortable than formerly, and the parametrial involvement can for a long period be held in abeyance, especially if radiation is combined with the external x radiation. Treatment with radium in such cases is a safe procedure, for in none of the eight cases radiated in the past seven years, has death resulted from its use. (2) The early cases when subjected to hysterectomy, show 34 per cent free from growth three years or more after operation, 25 per cent free five years or more, and where radiation accompanied hysterectomy, 44 per cent were free from the growth three years or more after operation, and 31 per cent free five years or more after removal. Where radium is used in limited amounts, (100 mgm. of the element), and the method of application is also limited, hysterectomy plus radiation, is the method of choice in early cases. Of 37 cases of hysterectomy combined with radiation, none have died as a result of the operation. Safety of the procedure is emphasized from the standpoint of postoperative mortality.

Carcinoma of Cervix Uteri: A Review of 100 Cases, with Especial Reference to Predominating Type of Cell. LAWRENCE A. POMEROY, M. D., and ABRAHAM STRAUSS, M. D., J. A. M. A., 83:1060-1062, Oct. 4, 1924.

IN the treatment of these cases, the exact radium dosage varied according to the conditions found in the individual case; but in most cases the dosage used was 100 mg. of radium element screened with 0.5 mm. of silver, 1 mm. of brass, and 1.5 mm. of rubber in the cervical canal, and from five to ten steel needles containing from 5 to 12.5 mg. of radium element inserted directly into the tissues of the cervix. The radium remained in position from twenty to twenty-four hours, making a dose of about 3,000 mg. hours. This was not repeated for two or three months, if at all.

The results of treatment have been taken from seventy-five cases in which complete data was available. Of these seventy-five cases, six, or 8 per cent, were classified as spinal type cell with pearls; thirty-one, or 41 per cent, as spinal type cell without pearls; eleven, 15 per cent, as adenocarcinoma; twenty-one, 28 per cent, as transitional cell type, and six, 8 per cent, as fat spindle cell type.

The opinion of the authors, following this series of cases, is tumors of the uterine cervix, belonging to the group of spinal cell type with pearls and to the adenocarcinomas give promise of better results after the radium treatment than do the tumors belonging to the other cell groups.

Modern Methods and Results of Treating Malignancy of the Bladder. HERMON C. BUMPUS, JR., M. D., J. A. M. A., 83:1139-1147, Oct. 11, 1924.

DIATHERMY, that modality of high frequency employing the bipolar (D'Arsonval) current, has a definite field of usefulness in urology. Medical diathermy, or themopenetration (sedative technique), by means of which we appreciably raise temperature within the tissues, has been demonstrated to be of decided value in treating epididymitis, endocervicitis and arthritis. On the other hand, surgical diathermy, or electrocoagulation, in which tumor cells are destroyed by intense heat to any desired depth (without carbonization), has proved itself superior to other methods in dealing with vesical neoplasms, tumors of the urethra and lesions of the external genitals. In the seventy-three cases of urologic conditions treated by the author with diathermy, either medical or surgical, reported in his article in abstract form, demonstrate conclusively the value of the procedure.

Primary Bladder Tumors in the First Decade of Life. CLYDE LEROY DEMING, M. D., New Haven Hospital,

New Haven, Conn., Surg. Gyn. & Obs., 39:432-442, Oct., 1924.

THE application of the mode of treatment for bladder tumors in the infant has not been previously reported. Cautery, radium, x ray, and total cystectomy remain untried. The base of the tumor and the adjacent bladder mucosa in the author's first case was thoroughly treated by diathermy after the greater part of the tumor had been removed. Radium was applied at that time, but even then a recurrence in six weeks was evidence that the treatment had been inadequate. A second reaction with a good margin of apparently normal bladder was followed by massive doses of radium externally, but even this did not prevent again a rapid recurrence of the tumor. There was only one other method for treatment: total cystectomy seemed a radical procedure for an infant, but the author's patient lived longer after operation than any other patient with myxoma recorded. Whether the tumor was at all retarded by the extensive excision, and subsequent irradiation, is to be questioned. "Since so vigorous a treatment resulted in failure," according to the author, "it is logical to believe that nothing short of a total cystectomy with dissection of the urethra would give an effective cure."

A Roentgenographic Study of the Infant Chest as Seen at Birth. W. W. WASSON, M. D., J. A. M. A., 83: 1240-1243, October 18, 1924.

PULMONARY structures undergo certain changes from birth to old age as a result of environment and the normal fibrosis which takes place in the body tissue from age. These changes must be considered as one great normal process. But before one can accurately interpret the adult chest, an understanding of the infant chest is necessary. The infant chest is the basis on which to build the interpretation of the adult chest. In this paper, the observations of the author are given on the early lung changes, after the first respiratory act and clearing of the atelectasis, and as to the appearance of the roentgenogram during the first weeks of life.

The new born child was immediately roentgenographed, and successive roentgenograms were taken thereafter in five minutes, ten minutes, fifteen minutes, twenty-four hours, and before leaving the hospital. A few stillborn infants were roentgenographed and the observations made.

Large Thymus Cause of Cyanosis in Newborn Infants. EDWARD T. EVANS, B. S., M. D., Boston, Mass., Surg. Gyn. & Obs., 39:494-498, October, 1924.

AFTER having carefully analyzed and studied the diagnosis of the causes of twelve deaths in babies between the ages of five days and three weeks who had suddenly developed cyanosis, the author offers the following conclusions: "(1) In newborn infants who develop cyanosis, whether constant or intermittent in attacks, in the absence of other definite causes, persistent large thymus should always be suspected. Such infants, even in extremes, should be given the benefit of x ray or radium therapy. Plates should be taken before and after treatment, to follow results. However, negative plates do not mean 'no thymus pressure,' as it is anteroposterior thickness and weight of thymus, not width, which causes pressure, unless the symptoms are due to an endocrine substance. (2) Diagnosis of bronchopnea obscure intracranial hemorrhage, and congenital heart disease should not be made without more seriously considering persistent large thymus as a cause of symptoms. (3) Because of recent work indicating persistence of the thymus gland as a relatively normal condition, cessation of symptoms following x ray treatment must be considered the more reliable criterion of diagnosis rather than the 'positive' x ray picture. (4) Treatment, as outlined, is advised with careful follow-up records to establish such favorable dosages. (5) We have found this treatment of definite value and believe we have lowered our infant mortality thereby. (6) Relief, while not immediate, occurs within a few hours, and the treatment is seemingly without danger."

Enlargement of the Thymus Gland With Report of Cases. FAITH FRANCIS HARDY, A. B., M. D., J. Michigan M. Soc., 23:403-407, Oct. 1924.

ENLARGED thymus is not an unusual condition to find in infancy. It not only causes a chronic obstruction to respiratory excursions and a possibility of cardiac embarrassment but it doubtless contributes largely to the mortality rate in pneumonia and other severe infections. It also occasionally causes sudden deaths during operative procedures. For these reasons alone it would be highly desirable to find a routine measure for the treatment of these cases, but it must be one that is devoid of danger to the child. In a small percentage of cases a harmful reaction seems to follow the use of radium, so it would seem better to use the x ray with its slower results, or to use half the usual dose of radium and apply it in two treatments. The reactions which follow the use of radium are probably due in part, at least, to an increase in the nonprotein blood nitrogen.

Tumors of the Breast. JOHN F. ERDMANN, M. D., Illinois M. J., 46:178-183, September, 1924.

THE author bases his observations on the data obtained from his record of 539 cases of breast operations, excluding those for mastitis, either chronic or suppurative. Of these operations, 22 were recurrent carcinoma operations, and 315 were carcinoma. There were 141 cystadenoma, of which about 117 were unilateral and 24 bilateral; 2 sarcoma; 2 tuberculosis; 4 lipoma; 3 aberrant axillary breasts; 1 hemorrhagic cystadenoma; 27 adenofibroma and fibrocystadenoma; and 38 peri and intracanalicular fibroma. The following points are particularly emphasized:

1. That no tumor in the breast is a desirable tenant even if its innocence be proved without a question of doubt.

2. That a growth in the remaining breast is as likely to be of primary origin as was that in the breast first removed.

3. That at the present day we are unable to state positively what the influence of x ray and radium is, either as a preoperative or postoperative aid. But in view of many apparent reductions in size, etc., previous to operation in cases that were considered nonoperable, the use of x ray and radium should be encouraged until proven a menace. In my opinion too few years have passed for positive results to be shown from these agents, even in view of some of the glowing reports at present regarding the nonrecurrence. Postoper-

ative treatment should not be neglected by preoperative, until some definite proof of its help or inefficiency has been proven.

4. That in the presence of late metastases the powerful currents of the present day should be given a thorough test—to prove or disprove the efficiency of this method of treatment.

5. That the most thorough and painstaking wide removal with remote glandular and fascial dissections will tend more and more to increase our percentage of cures and extension of life. That the radical operation is attended with so low a mortality as to promote a greater desire on the part of the consulting physician to demand early operation.

6. That the use of radium and x ray as cures in the malignancies of the breast, so far are discouraging.

Carcinoma of the Breast with Pleural and Pulmonary Metastasis. M. J. OWENS, M. D., J. Missouri M. A., 17:331-334, October, 1924.

THE author presents four case histories and the treatment and results obtained in each. From his experience, x ray and radium is the only means by which pleural and pulmonary carcinoma can be benefited. Osgood says: "Success of x ray treatment depends primarily upon the administration of a lethal dose to the site of the lesion, the dose to be given en masse and not fractionally. Sublethal dosage may produce inhibition but may later produce a compensitory increase in the activity, the progress of the growth being much more active than if untreated. Prolonged sublethal dosage may produce an immunity to the ray. This fact may account for the rapid growth and metastasis of what was apparently a clinically cured cancer and on which subsequent radiation may have no effect."

Reactions to x rays constitute a drawback to some individuals to the administration of so-called lethal dosages. These have been termed "toxic" due to breaking down of tissue and occur three to six days after exposure and x ray sickness due to the change in the blood, manifested by nausea, vomiting, and extreme weakness. There are patients who complain of both of these conditions after exposure to either x ray or radium.

Roentgen Findings in Mediastinal Diseases. C. H. BALLARD, M. D., Nebraska M. J., 9:438-440, November, 1924.

DR. BALLARD makes a plea for early roentgen examination of cases presenting themselves with symptoms of mediastinal disease. Even when these symptoms are slight, the x ray may uncover well developed pathology. It will often help to amplify and elucidate the physical findings especially in the early stages of the disease when therapeutic measures can accomplish the greatest good for the patient.

Die Mediastino—Interlobare Pleuritis Ein Haufiges Vorkommen Bei Der Mediastinal—Drusentuberkulose. FELIX FLEISCHNER, Acta Radiol, 3:307-325, 25:8, 1924.

THE writer shows by illustrations that an exudative pleuritis in the mediastinal and interlobar pleural space, especially to the right between the middle and lower lobes, frequently occurs in the course of tuberculosis of the mediastinal lymph glands. This complication is explained by the extremely close relation of certain groups of glands to the pleura. Besides roentgenoscopy in the transverse plane, an examination in "saddleback" position is especially suited for proving this exudate. In this position, shadows that before had quite an uncharacteristic shape collect to form dense, sharply circumscribed shadows having the shape of triangles, bird's beaks, or spurs and situated close to the middle shadows. The pathological, clinical, and roentgenological significance of the aspect of the disease is discussed.

Annular Shadows in the Roentgen Picture as Indications of Localized Pneumothorax. P. FLEMMING MOLLER and G. E. PERMIN, Acta Radiol, 3:297-306, 25:8, 1924.

THE authors have described three cases of pulmonary tuberculosis, in which the roentgen pictures showed annular shadows, though the stethoscopic and every other clinical examination failed to reveal the presence of any cavity, and in which a roentgen examination made at a later date showed the annular shadow to have disappeared. From the evidence at hand, they believe that in these cases there could not, as a matter of fact, be any cavities. They can therefore only explain these small annular formations as cases of localized pneumothorax which have disappeared afterwards. In the fourth case, the annular shadow persisted, but its size varied markedly from one time to another, and there were no unfailing signs of any cavity. Also in this case, the authors believe a localized pneumothorax to be the most probable explanation.

Carcinoma of the Lung. Report of Four Cases. E. A. BAUMGARTNER, Ph. D., M. D., and F. R. WRIGHT, M. D., F. A. C. P., Clifton M. J., 10:112-122, September, 1924.

PRIMARY carcinoma of the lungs forms at least one per cent of all cancers. The cases here had a rather definite history and findings that are quite characteristic. The pain in the chest with cough, more or less sputum, marked loss of weight and strength, with definite chest findings both clinically and x ray, gives a rather clear picture. Three cases had fever which has been described as rare in lung cancer.

The first case presented a lesion of the larynx, which was confusing and shadowed the diagnosis. In the third case, the condition was questioned whether the growth was primary or secondary to a primary cancer of the breast that had been removed twenty years previously. The second case was definitely diagnosed by the mass expectorated which showed mitotic cells in bronchial epithelium.

Cases over fifty years of age with a history and findings suggesting cancer should have the service of a competent roentgenologist. With these findings positive, more and more cases will be diagnosed. Only by this and by learning to diagnose cases earlier may it become possible to do something surgically or by the x ray therapy.

Importance of Careful Roentgen Ray Investigations of Apical Chest Tumors. HENRY K. PANCOAST, M. D., J. A. M. A., 83:1407-1411. Nov. 1, 1924.

IN infiltrating growth, either endothelioma of the pleura or sarcoma, probably of bony origin, may occur in the apex of the thoracic cavity and produce a symptom complex of pain in the upper extremity and cervical sympathetic paralysis closely simulating that of many other

conditions, such as spinal cord or meningeal tumors, neck tumors, cervical rib and vertebral neoplasms. Roentgen ray examinations of the shoulder alone before the appearance of the eye manifestations may fail to reveal such a growth, and a wider area should be included in the obscure cases. In roentgen ray examinations of the spine and for cervical rib, the roentgenograms should be carefully studied for any increased density in the apex of the lung or adjacent vertebrae.

Heliotherapy in Advanced Pulmonary Tuberculosis. I. D. BRONFIN, M. D., Colorado M., 21:334-337, November, 1924.

FIFTY cases with an average period of one year under heliotherapy have been carefully studied. Forty had advanced, active disease, and a total number of 32 suffered from extra pulmonary complications. General and pulmonary improvement was noted in 18. One year after the discontinuance of treatment 13 are more or less unchanged, 2 had relapses and 3 are dead. Of the 22 whose pulmonary disease remained stationary, 14 experienced temporary general improvement, and of these 5 have acquired full time working ability. Only ten became progressive. The experience at the Colorado Sanatorium has been: (1) heliotherapy has not yielded encouraging results in advanced pulmonary tuberculosis; (2) neither the favorable nor unfavorable results can be attributed with certainty to heliotherapy; (3) heliotherapy is at least as dangerous an agent as tuberculin if used injudiciously; (4) there are many points of resemblance in the body reactions between radiation and tuberculin; (5) hemoptysis is no contra-indication to its use; (6) extra pulmonary lesions are invariably favorably influenced with heliotherapy.

Scrofuloderma Gummosa (Tuberculosis Colliquativa). H. E. MICHELSON, M. D., Arch. Dermat & Syph., 10:565-576, November, 1924.

TUBERCULOSIS colliquativa is a distinct type of true cutaneous tuberculosis which does not necessarily arise from tuberculous glands or bones, but may begin in the cutis or subcutis..... "For tuberculosis colliquativa, Volk simply recommends roentgen therapy, heliotherapy, and tuberculin. Certainly there is no specific course to outline. In one of the cases healing occurred under mercury vapor lamp exposures alone, while in another case there was little response to all of the foregoing recommendations. Volk, in a later communication, highly praised filtered roentgen rays as giving the quickest result and the healthiest scars. General treatment is the same for any type of tuberculosis, and is especially important in this form in children."

Radiography of the Gallbladder. R. KNOX, Acta Radiol, 3:265-293, 25:8, 1924.

THE chief point to recognize in technique is the need for rapid exposure, and the complete immobility of the part under examination. The question of purgation just prior to an examination and the time when food is given, are of importance.

The composition of the gall stone has an important bearing upon the result of radiographic examination. Cholesterin, when pure, throws only a faint shadow, which is readily absorbed by superimposed structures, such as the liver, kidney, etc., therefore it is difficult and a very rare occurrence to demonstrate a pure cholesterin stone by the direct method. Pure cholesterin and stones containing only a small percentage of calcium salts float in water, while those with a larger percentage of the heavier metals sink to the bottom. This in a rough way gives one an estimate of the relative percentage of gall stones demonstrable by the direct method.

The differential diagnosis in lesions of the right upper quadrant of the abdomen is extremely difficult, on account of the number of important organs in that region; hence every known method must be employed in the investigation of difficult cases; these entail the use of pyelography among others. Lateral radiography and pyelography are of the most importance in the distinction between kidney and gall stones, and no examination is considered complete by the author until this has been done.

The reason of the difficulty of roentgen ray diagnosis is largely one of density of the gall stones, therefore the argument is advanced that if any movement occurs during the exposure it may modify the radiological value of the negative. Movements are described as voluntary and involuntary; of the latter the possibility of movement of the gallbladder and ducts during the exposure may be sufficient to spoil a good negative. Movements of other organs in this region, as the duodenum, stomach, aorta, etc., may have a similar effect. Consequently it is urged that the exposure in work of this kind be as short as possible.

Numerous illustrations accompany the article to emphasize each individual branch of the discussion.

X Ray Diagnosis of Gallbladder Lesions. C. HARVEY JEWETT, M. D., Clifton M. J., 10:85-90, September, 1924.

THE x ray evidence obtained from the examination of gallbladders has been divided into direct or primary findings and indirect or secondary findings. The direct findings consist in the actual visualization of the gall stones or the shadow of the gallbladder on the films which, unfortunately, is only accomplished in a comparatively small percentage of cases. The consistency of the gall stones varies to such an extent that many of them will show no evidence of their presence on the films regardless of the technique employed. For example, a pure cholesterin stone has a density that is much less than the surrounding bile and may show a negative shadow. It is the general consensus of opinion that with the ordinary technique a gallbladder which can be seen is a pathological structure having either a thickened wall, or is filled with thick inspissated bile, or multiple soft calculi. On the other hand, the fact that the gallbladder can not be seen, and in the presence of shadows typical of calculi, gallbladder pathology can by no means be ruled out. The most common indirect signs are caused by adhesions of the gallbladder to some portion of the gastro-intestinal tract. Adhesions to the pylorus will often cause it to swing to the right and remain fixed in this position. In regard to the duodenum caput the same displacement and fixation to the right and upward is again characteristic of adhesions, and in this instance the caput may be deformed, suggesting duodenal ulcer. Another sign of importance is the evidence of adhesions to the hepatic flexure or transverse colon sometimes giving the appearance of reduplicated hepatic flexure.

The direct signs are present only in a small percentage of cases, estimated by some observers as 25 to 30 per cent. As far as the value of negative x ray reports is concerned, this is an undecided problem.

Pathology, Diagnosis and Treatment of Gall Stones. L. J. AUSTIN, M. A., F. R. C. S. (Eng.), F. A. C. S. Northwest Med., 23:389-391, September, 1924.

IN the diagnosis of gall stones an x ray examination is necessary. With increasing efficiency of technique, gall stones are being more frequently demonstrated by the x rays than even a few years ago, and some observers claim to get 70 per cent positive results. However, this other 30 per cent, in which the x ray examination shows a negative finding, must not disappoint one from using this as a routine measure, or permit it to unduly influence one's diagnostic opinion or the treatment to be advised. X ray examination with barium and fluoroscopic observations should be carried out and it may give additional information as to the pyloric spasms and adhesions that may be valuable in determining a definite diagnosis. It has also been found that an x ray examination taken after the abdominal cavity has been distended with gas, will give a more precise indication of the position, shape and size of the gallbladder than an ordinary picture. (The author makes a notation at this point that he has never had any experience with this method himself and does not care to use it.) Ordinary test meals and the examination of the stomach contents gives a very contradictory and uncertain information. The Lyon-Meltzer test, whereby the contents of the gallbladder and ducts can be obtained for investigation by means of a duodenal tube, gives information as to whether there is an infection of the hepatic tracts, but does not tell whether or not this is due to, or associated with, gall stones. There is only one method to accurately make this determination and that is by the roentgenological examination.

Chronic Gallbladder Disease in the Young Adult. ARTHUR T. MANN, M. D., and HUGH S. WILLSON, M. D., Minneapolis J. A. M. A., 83: 981, Nov. 13, 1924.

THE diagnosis of chronic cholicystitis can be made much earlier than it is made, as a rule." The basis of this assertion is a series of fifty-seven cases of chronic gallbladder disease in young adults, operated on in the early stages of the disease, with no mortality. Chronic cholicystitis associated with chronic, localized changes in the liver, radiating from the gallbladder region in all the series of cases. Colic, pain referred to the shoulder, and jaundice are usually absent in these early cases. A complete gastro-intestinal roentgen ray study was made of all patients and the negative findings used to rule out gastric and duodenal lesions. This procedure enabled the authors to eliminate the possibility of gastro-intestinal pathology from their problem and to attempt to fit the obscure symptoms to other regions.

A New Aid in the Diagnosis of Tumor of the Head of the Pancreas. JACOB BUCKSTEIN, M. D., New York, Surg. & Gyn. & Obs., 39:509, October, 1921.

A concomitant increase in the size of the duodenal curve is the most significant radiological evidence in the diagnosis of enlargement of the head of the pancreas. Frequently pancreas involvement is difficult to demonstrate by the ordinary method of filling the stomach with barium. This difficulty may be overcome, "by passing a rubber tube until the metal tip reaches the end of the transverse duodenum, as determined fluoroscopically. The last ten (10) inches of tube is perforated with numerous small openings. Barium was injected through the proximal end of the tube, and a roentgenogram taken. The barium escaping through the holes in the distal portion of tubing, outlined the duodenum. In this manner, a much clearer idea of the duodenal curve was obtained, than was possible by the ordinary indirect method of barium injection. The duodenal curve appeared to be enlarged, suggesting a tumor of the head of the pancreas. This was confirmed by an explanatory laparatomy."

Two Cases of Lymphangioma Cysticum Originating from the Omentum Healed with Roentgen Treatment. EMIL JERLOV, Acta Radiol, 3:354-366, 25:8, 1924.

THE writer gives an account of two cases of cystic, multilocular lymphangioma, originating from the omentum. The first case is a 42 year old man, the second, a 30 year old woman. Both cases are operated upon, but in neither of them could a complete operation be accomplished. Both cases have been after treated with roentgen rays, and it has been found that the roentgen treatment has had an extraordinarily beneficient effect. In the first case, which has now been under observation for the past four years, taking of tissue for study was the only thing that could be done at the operation; in the second case which has been observed for one year, the main tumor was removed. Both cases are at present completely free from symptoms.

A Case of Bismuth Subnitrate Poisoning with Fatal Issue Following an Injection of Beck's Paste. AXEL WESTMAN, Acta Radiol, 3:344-353, 25:8, 1924.

THE writer gives an account of a case of bismuth subnitrate poisoning with a fatal issue following the injection of 75 cc. of Beck's bismuth paste into an empyema cavity. The toxicological aspect is characterized by a grave stomatitis followed by a metallic margin around the teeth, attacks of profuse diarrhea which became bloody towards the end, icterus, bleedings from the nose, and nephritis. All the changes are interpreted as caused by the bismuth component of the preparation, whereas there are no signs of nitrate poisoning.

Radiography of the Pneumatized Parts of the Skull. M. A. WALKER, M. D., Northwest Med., 23:397-401, September, 1924.

THIS paper, according to the author, is intended simply to call attention to the value of radiologic examinations in the diagnosis of these pathologic conditions and as an aid in their treatment. Not infrequently, after having found no source of chronic absorption in the most common locations, such as tonsils, teeth, or genito-urinary tract, the trouble has been found to exist in the presence of a pathologic maxillary, frontal or sphenoidal sinus. Many times this condition exists without enough local symptoms to attract the attention of the patient.

"From my experimental work, the most generally correct result seems to be obtained with this technique: Place the patient so that the malar bone, nose and forehead are in contact with the cassette. Locate the tube so that the central ray will enter at a point 6.5 cm. above and 4.5 cm. posterior to the central meatus, emerging about the center of the lower quadrant of the orbit. This will generally give a correct radiograph in the dried skull, then the measurements are easy. In the living, on account of the secondary rays, slight diffusion and lack of contrast, very careful technique and interpretation are called for."

Localization of Brain Tumors by Injection of Air into the Ventricles of the Brain. W. E. DANDY, M. D., J. Missouri M. A., 21:329-331, October, 1924.

THE importance of an early diagnosis and early treatment of brain tumors is the same in principle as the early diagnosis and treatment of acute abdominal conditions. The extirpation of a considerable percentage of brain tumors is possible, if the diagnosis is made before there is too much destruction and an open magnified expression of the condition. Brain lesions are very frequent lesions affecting the central nervous system between the ages of two and sixty.

Brain tumors give rise to two kinds of symptoms, those of pressure and those of localization. The pressure symptoms are fairly characteristic—headache, vomiting and choked disc. Brain tumor is by far the most common lesion to give rise to these above enumerated symptoms, just as in acute abdomen the appendix is the lesion to be considered first. In the early stages of the disease, there may be present only one of these symptoms, either headache, or at times only vomiting and choked disc; but this is the important stage for the patient's benefit. As tumors grow, they gradually encroach upon those parts of the brain that give localizing symptoms. The reason that localizing symptoms are so uncommon early is because of the great silent areas of the brain, but when the tumor passes these bounds and enters parts of the brain having function, paralysis, loss of vision, loss of smell and hearing, convulsions, staggering gait, and other manifestations, are the result.

In the cases that cannot be localized by common neurological or roentgenological examinations, Dr. Dandy recommends that air be injected into the brain for diagnosis and localization. The fluid containing spaces in the brain are filled with something which will throw a shadow in the x ray. This something is a gas which has a lesser density than the fluid removed. As a preliminary to the injection of air, an opening must be made in the skull on both sides so that either lateral ventricle can be reached by a ventricular needle. Fluid is then aspirated and exactly the same amount of air is injected in its stead. The air can be moved through the entire ventricular system in such a way that any part which one desires to see can be thrown on the x ray plate. By comparison of the distorted shadows with the normal shadows, a localization of the tumor which is causing this disturbance can be made. All brain tumors that give rise to pressure symptoms will cause a change in size, shape or position of part or all of the cerebral ventricles and the interpretation of these changes leads to an accurate localization of the lesion.

About 50 per cent of brain tumors can be localized by a neurological examination and about 15 per cent more can be localized with the x ray without air injections. Such x ray changes are: (1) desposits of calcium in tumors; (2) change in the vascularity of the blood vessels of the skull; (3) localized and more or less generalized destruction of the inner table of the skull. In the remaining 35 per cent, the injections of air can alone make the localization possible. It is a dangerous procedure and should be used only when necessary.

The Cerebroventricular Study. GEORGE W. SWIFT, M. D., Northwest Med., 23:452-459, October, 1924.

IN 1919, Dandy published his work on the use of air in the roentgenography of the cerebral ventricles. There was gradually developed a new method of examination of intracranial conditions known as "the cerebroventricular study." The three factors in this complete study are, (a) the eye, (b) the cerebrospinal fluid, (c) the ventricles.

The eye is important particularly with reference to changes in the cerebrospinal fluid and oedema of the brain. In studying the cerebrospinal fluid, the tension may be observed, which is easily recorded by means of lumbar punctures and a spinal manometer. While the needle is still in the spinal canal and after the fluid has been withdrawn, an equal volume of air is insufflated and x ray films made. If, however, the ventricles are not shown to contain air in these radiograms, it will be necessary to insert air directly into the ventricles after the method of Dandy and the radiograms repeated. Any changes in the size, shape, or position of either or both of the ventricles can be quite accurately determined, if the technique has been correct and the films properly developed.

The following technique has proved successful in practically all cases of ventricular study:

1. From the time the air is injected into the spine do not change the head from the upright to the prone position; slight changes do not matter.

2. X rays may be taken with the patient in the upright position with the occiput against the plate for anteroposterior films and with either right or left side to the plate for laterals, the head still in the upright position.

3. The setup for the machine is as follows: Distance from the tube to the film, 25 inches; milliamperes 20, spark gap 4½ inches, exposure anteroposterior 11 sec., lateral 10 sec., Superseed films used.

Using this technique, with special care to keep the patient in the upright position, will usually give excellent results.

Studies of the Mineral Salts in Their Relation to Malignant Tumors. G. L. ROHDENBURG and O. F. KREHBIEL, Columbia University, Institute of Cancer Research, J. Cancer Research, 8:423-441, October, 1924.

IN the course of a number of experiments reported on the Flexner-Jobling rat carcinoma, the effect of a combination of small doses of x ray and injections of sodium chloride upon the salt content of the blood of normal rats and of rats with growing transplanted sarcoma was noted. Tumor bearing animals reacted differently from normal rats. In normal rats, small amounts of radiation pro-

duced a reduction in the total of the potassium, sodium, and calcium content of the blood, while in tumor bearers the same reduction occurred but was more marked. A distinct increase in the salts of the blood, with a greater relative amount of sodium, was brought about in normal animals by combining sodium chloride injections with x ray treatments, but in rats with growing sarcomata no increase was manifest.

Benign Foreign Body Giant Cell Tumors in the Long Bones. HENRY W. MEYERDING, M. D., J. A. M. A., 83:1323-1329, October 25, 1924.

IN reviewing the cases of bone tumors examined at the Mayo Clinic between the years 1909 and 1922, the author selected a group of twenty-four benign giant cell tumors of the long bones for presentation. The origin of these tumors has been ascribed to trauma and inflammatory processes. The date of the primary injury is inessential as far as the observation of the tumor is concerned. These patients seldom appear sick, and are usually employed up to the time of their consultation. The conclusions of the author emphasize the following points:

1. A benign giant cell tumor of the long bones, with characteristic clinical, macroscopic and microscopic findings, has long been recognized by surgeons and pathologists. The tumor usually grows slowly and produces little clinical evidence until it is large enough to cause pressure symptoms.

2. The microscopic appearance of the tumor suggests an inflammatory origin. Trauma in the presence of focal infection may be the cause. Continued use of the term "sarcoma" in referring to this tumor is misleading, and unnecessarily alarms the patient. A sharp line of differentiation of benign and malignant tumors is advisable.

3. The roentgen ray findings, although of great importance as diagnostic and surgical aids, are not always characteristic.

4. The treatment should be conservative. Curettage, followed by phenol, zinc chloride, or the use of the actual cautery, is advisable.

5. The prognosis in these cases is good as regards life, and good functional results in the extremities may be obtained unless the destruction of bone has been too extensive. Malignancy has been observed by Coley, Stone and Ewing in tumors that were supposedly benign.

6. In the series of twenty-four consecutive cases seen at the Mayo Clinic between 1909 and 1922, in which operation was performed, and microscopic examination made, twenty-three patients have been traced, from two to fifteen years after operation, and are without evidence of metastasis.

7. The patients had been aware of the tumors on an average of twenty months before they presented themselves for treatment.

8. The history and the clinical, the laboratory, roentgenologic, macroscopic and microscopic findings should be considered in making a diagnosis, although experienced clinicians, surgeons, roentgenologists and pathologists may often diagnose these tumors correctly from the laboratory and clinical findings alone.

Primary Giant Cell Tumors of the Vertebrae: Analysis of a Group of Cases, with Report of Case in Which is Well Two Years and Nine Months After Operation. DEAN LEWIS, M. D., J. A. M. A., 83:1224-1229 October 18, 1924.

THE author presents case reports for sixteen cases. Recovery after partial removal or after no attempt at removal, was noted in thirteen of these cases. The roentgen ray and radium have been used in some of the cases, but no particular result was given in the report.

The Significance of Lumbosacral Pain (Backache). GEORGE MARTYN, M. D., J. A. M. A., 83:1297-1299, October 25, 1924.

BACKACHE, in a majority of instances, is a symptom that is curable and belongs to the domain of neurology and internal medicine. The cerebrospinal system is conveniently divided into the following divisions, marked by definite anatomic boundaries: (1), Peripheral nerves from the periphery to the plexus of spinal nerves. This pain is paroxysmal and acute, originating in any violent movement, and dies down after relaxation. It is stabbing in character and may be induced by pressure and palpation; (2), Plexus, extends from the peripheral nerves to the external opening of the intervertebral foramina. Plexus pain radiates so that the whole adjacent limb is involved; (3), Funiculus extends from the external opening of the intervertebral foramina, through the bony canal and includes the opening through the dura mater. This pain is common and is considered funicular if accompanied by absolute rigidity of the spinal column—the spine mobilized in a painless position; (4), Radiculus extends from the internal opening of the dura mater to the cord. This pain is rare, is not accompanied by spinal rigidity, and the spinal fluid shows a positive pleocytosis. The opinion of the author is that common backache is produced by a lesion, usually inflammatory, of the structure that occupies the intervertebral foramen.

The author takes for his discussion 153 patients suffering from chronic backache who have been examined and treated during the last two years. In the laboratory examinations particular attention was given roentgenographic tracings of the teeth, nose, throat and sinuses. In case of the complete extraction of the teeth, roentgenograms of the superior and inferior maxillae were taken. Classification of the cause of pain was made from these complete physical and laboratory findings on the 153 patients: (1), Trauma, two patients as a result of slipping; (2), Gallbladder disease, 13 patients, all women; (3), Syphilis, 11 patients, ten men; and (4), Focal infection, 127 patients. Of these focal infections, eight were due to tonsils and 97 to periapical abscesses.

In making the diagnosis, the pain should always be located; and the condition of the blood should be studied. Any leukopenia with lymphocytes increased to more than 30 per cent, has meant, to the author, mouth infection, either of tonsils or teeth. Toxemias always change the blood picture.

Backache, in the majority of cases, has a pathological cause which can be located, and there is only one treatment—removal of the cause. "As a palliative procedure, I use the mercury quartz air cooled ray. It brought, in some cases, relief that lasted for many months. In others, it simply relieved the pain for a few hours, but in every case it brought this valuable help—relief of pain until a study could be made of the cause. The length of the first exposure is a very important point. This is important because pigmenta-

tion occurs very rapidly, and the maximun penetration is essential for the first radiation. Pigmentation will obstruct subsequent treatments, and they are never as successful in relieving pain as the first. The ray also has one advantage. It increases very markedly the general nutrition of the body through the blood stream. This is shown clearly by the largely increased leukocytosis after its use, and these patients are always exhausted and low in nutrition, as a result of a long standing toxemia and pain..... I have had little occasion to use drugs of any kind."

Congenital Syphilis. EDW. R. COX, M. D., Southwestern Med., 8:428-432, September, 1924.

IN the diagnosis and treatment of congenital syphilis, x ray is of the utmost value. An x ray of the long bones for evidence of periostitis, gummatous invasion or osteomyelitis, is a very valuable procedure. The bone changes in hereditary syphilis are productive.

Interpretation of Dental Radiographs. HUGH W. MACMILLAN, M. D., Cincinnati J. of Med., April, 1924.

IN dental diagnosis, the roentgen ray is only a laboratory means of enabling the dentist to make a correct diagnosis. Dental radiography has its limitations in that it fails to show the vitality or nonvitality of the pulp until after destruction of the periapical tissue, which may take months or years following the death of the pulp.

A dental radiographic report should contain information relative only to the densities which are departures from the normal. It should point out specifically abnormal densities in the alveolar border, the walls of the alveolus, the periapical region, the root of the tooth, the crown of the tooth and any departure from the normal position of the teeth, as well as root canal fillings and recurrent caries. The pathological terms enumerated above should be left entirely out of the report unless the examiner is willing to take the full responsibility of the complete examination. Each and every one of the changes from normal should be noted. To mention only one tooth among several pulpless teeth which happens to have a large area of rarefaction about it is misleading to the physician, dentist, and patient and increases the skepticism and loss of confidence of the patient, who is at loss whom to believe in the controversy regarding the disposition of the teeth.

Similar to the caption printed on certain business stationery, "This order contingent upon strikes, fires, floods and other conditions beyond our control," the author suggests that a caption should be placed upon the dental radiographic report which should read as follows: "This report records only the abnormal densities capable of being shown by the x ray and is, from a diagnostic standpoint, in no manner conclusive. Infective foci may be present which have not advanced sufficiently far to be shown by the x ray. The interpretations of these densities must be done by means of vital tests, other objective methods and the patient's general history."

The caption should be used for the following reasons: (1) It has been shown that due to certain structural characteristics many parts of the teeth and surrounding bone cannot be shown by the roentgen ray; (2) Pulp vitality or nonvitality is not conclusively disclosed; (3) Acute and subacute inflammations of the teeth, gums and peridental membranes are not recorded; (4) The virulence of the infection is not determined radiographically. How many times must it be emphasized that the size of the destructive area has nothing to do with the virulence of the organism? (5) The interpretation depends upon the general resistance of the patient; (6) The interpretation depends upon the age of the patient; (7) The roentgen ray does not show the character of the root filling operation. It makes considerable difference if the canal is filled *a la Callahan* or by some embalming or devitalizing agent; (8) The interpretation depends upon the history of the teeth as in orthodontic treatment, abrasions, accidents or surgical operations; (9) The x ray has not been able to investigate and report upon the character of the pulp and the putrid material under misfitting gold crowns. Here is where the negative report is absolutely valueless; (10) The interpretation depends upon the general history, local dental history, laboratory examinations, and the evidence peculiar to the individual patient, none of which are shown in the film.

In the closing paragraph, the author emphasizes that in no other field of medicine, is the co-operation of physician and dentist so absolutely indispensible as in attempting to arrive at a correct diagnosis. If dental radiographs were interpreted in the same manner that radiographs of other parts of the body are interpreted, i. e., in conjunction with the clinical findings, this closer relationship and co-operation will be realized and the patient immeasurably benefited.

Treatment of Goiter. CHARLES A. ELLIOTT, M. D., Illinois M. J., 46: 190-193, September, 1924.

IN the experience of the author, the following factors have proved of definite therapeutic value: (1) Early diagnosis and clinical classification. This is prerequisite to the effective treatment of any form of goiter; (2) Rest in bed; (3) Dietetic management; (4) Administration of iodine; (5) Elimination of infection; (6) Irradiation, x ray and radium; (7) Surgical interference.

The author's experience with radium has been limited chiefly to severe cases of hyperthyroidism which were considered poor operative risks and to patients who refused operation. Irradiation unquestionably reduces thyroid activity by direct action on the parenchyma of the gland and on the blood vessel epithelium. It has not seemed of decided benefit in the type of case in which it has been employed.

Endothermy, the New Surgery, as Applied to Accessible Epidermoid Carcinoma. GEORGE A. WYETH, Boston M. & S. J., 191:662-666, October 9, 1924.

ENDOTHERMY, the production of heat in the tissues from within is the method by which a neoplastic growth is removed as a mass of dead cells rather than as a mass of living cells. This method is mainly applicable only to those lesions that are accessible, or to those lesions in body cavities that may be made accessible; the user of endothermy is able to become highly specialized in its employment.

In these accessible lesions, endothermy has this advantage over such physical measures as radium and x ray, that its results are achieved promptly. Both patient and operator are spared those time consuming tissue conversions which make the out-

rome of the other methods so long uncertain and so often disappointing.

The author uses for his discussion four specific cases which were epitheliomas of the nose, lip and hand, respectively. In each case the malignancy was demonstrated by pathological specimens taken from the center of the growths. The complete isolation of the malignancy always preceded the sectioning for pathological examination. The isolation of the malignancy from the healthy tissue was obtained by the dehydrating needle of monopolar endothermy. The growth itself was next attacked by this same monopolar dehydrating current and destroyed in situ. It was then curetted away; the mass as inert as wood. The base was seared over with the brushing of the current, and a simple dressing applied. The operation was bloodless, it required only about ten minutes of time, and there was no pain either during the operation or afterward. The patient's recovery was rapid, the cosmetic result good, and no recurrence was to be feared since sufficient adjacent tissue had been removed. The postoperative care is practically negligible.

Studies on the Physiological Action of the Natural Radioactive Water of Hot Springs, Ark. M. F. LAUTMAN, M. D., Southwestern Med., 8: 435-437, September, 1924.

AN analysis of the water, in 1901, by Dr. Bertram B. Boltwood, of Yale University, reported that: "(1) The waters of the springs on the Hot Springs Reservation are all radioactive to a marked degree; (2) The radioactivity of the waters is due to dissolved radium emanation (or gas) and not to the presence of salts of radium."

Experience and careful observation have shown that the beneficial effects of the natural thermal waters of Hot Springs, Arkansas, are due, in all probability, to the action on metabolism and elimination, and that the medical conditions most benefited are those in which the disturbance is due to toxemia, either of bacterial or metabolic origin. Under the first heading may be classed the infectious rheumatic diseases (both gonorrheal and acute articular), syphilis and malaria. The second group includes gout and chronic arthritis, neuralgia, all forms of nephritis, chronic skin diseases, especially the squamous varieties and chronic cardiovasculorenal disease with increased arterial tension. Benefits may also be expected in anemia and other diseases of the blood and blood forming organs, diseases of the ductless glands, and catarrhal conditions of the gallbladder, bile passages and gastro-intestinal tract.

Radiology and Its Significance in Clinical Stomatology: Or, Clinical Stomatology from the Aspect of the Medical Roentgenologist. BYRON C. DARLING, A. B., M. D., Rev. of Clin. Stom., 1:77-81, August, 1924.

IN the opinion of the author, the use of the x ray machine for diagnostic surveys by the dentists may be a mistake, for the following reasons:

"1. Few dentists take time to perfect themselves technically so as to get clear enough roentgenograms. Few dentists have been able to obtain trained assistants for this work.

"2. Capacity to interpret comes only through long experience. The mere fact that a picture is presented of the x rayed parts does not eliminate the difference between an amateur and an expert roentgenologist. There are many roentgenographic variations of the same thing, and only experience and familiarity can give a proper sense of values—an entirely different matter from being able to recognize something pointed out by the expert.

"3. It does not pay, for an x ray machine costs more than it returns to the individual dentist. It is costly in its original investment. The dentist uses the machine, comparatively speaking, less than he does any other piece of equipment. Therefore, he loses the idle time of his machine. It does not pay him therefore to spend time studying a speciality and to spend money installing a machine that will not give a return on the money and will take his time from his own speciality.

"4. The chief reason is, of course, that a man can not practice two specialities at once. Dentistry is enough without studying x ray work as a sideline.

"5. Closely related to the above is the necessity of the dentist's staying within his province and placing himself, when general medicine is involved, in the same relation advisory to the diagnostician as the surgeon does."

Observations Respecting the Sense of Pain in Skin Exposed to Ultraviolet Rays. V. MALMSTROM. Acta Radiol. 3:327-343, 25:8, 1924.

EXPOSURE to ultraviolet rays produces distinct changes in the sense of pain of the skin. This light effect has a shorter latent period than the light erythema and can therefore be demonstrated earlier than that, and it persists long after the acute erythema has disappeared. It manifests itself, *inter alia*, by hyperalgesia and by a prolonged duration, often excessively so, of the painful sensation that has been produced by a momentary irritation and which also exhibits either reiterated crescendoes and decrescendoes or else one or more intervals (*iterated painful sensations* or *succedan polyaestesia.*)

Distinct sensations of cold are sometimes observed which either alternate with the iterated painful sensations or bring the whole to an end. When the light erythema has begun to abate, it happens that the irritation immediately causes a painless tactile sensation followed first by an interval and then, after a comparatively long latent period (for longer than a normal latent period of sensations of pain), by an intense and frequently iterated painful sensation.

Not infrequently the retarded sensation of pain appears simultaneously with a capillary vascular reflex.

After-sensations are localized to the point from which they are originated, and to the immediate neighborhood. They frequently radiate also into more distant skin areas. In one experiment the writer had an opportunity of anaesthetizing the smarting skin area (the point of the pricking and the surrounding area) while the after sensation lasted. Although there was complete insensibility to the new interferences, the after sensations that were localized to same area, continued.

The writer mentions the previously known phenomena that have been observed in normal and pathological conditions and are analogous to those described above, as well as their explanation according to the most important theories of the sense of pain. The irradiated skin is surely an easily accessible and, in all probability, a yielding field for studies of the sense of pain which is still puzzling in many respects.

The Treatment of Neoplastic Diseases of the Oral Cavity with Histological Data. WILLIAM L. CLARK, M. D., Dental Cosmos, 66:1177-1182, November, 1924.

"SINCE the etiological factor is still unknown, no specific having yet been discovered, we must use such methods as have proved to be of value in combating the disease. They include surgery, x ray, radium, and electrothermic methods (desiccation and coagulation.) While surgery plays an important rôle, its usefulness has in many cases been enhanced by the employment of x ray or radium as preoperative and postoperative adjuncts. In certain instances x rays and radium, either singly or in conjunction, have entirely replaced operative surgery. Like surgery, desiccation and coagulation remove the tumor growth, but, unlike surgery, they do not act as a mere physical agent, removing the growth *en masse*, but destroy the neoplastic cells *in situ* to some depth below the actual tissue located. In the removal of a neoplasm, while the chief object is the destruction of the malignant cells, a secondary important factor is the maintenance and preservation of the vitality of the adjoining tissue, and that is influenced in a large measure, if not altogether, by the associated degeneration and fibrosis. The observation that the resulting scar in the use of electrocoagulation is soft, and is not as extensive as that resulting from the use of other methods, may not only be confirmed clinically but also explained histologically.

"The electrothermic methods are governed by certain fundamental principles. They are dependent for their results upon the resistance of the tissue to the current, which manifests itself in the formation of heat. The high frequency current used in the desiccation is of a relatively low amperage, producing only a moderate degree of heat, but of sufficient intensity to cause complete evaporation of the fluid content of the cell. The coagulation current is, on the other hand, of comparatively high amperage and low voltage, and induces such intense heat that the cells are not only dehydrated but their protoplasm is coagulated as well."

The desiccation of neoplastic tissues presents typical microscopic characteristics. The cells still retain their outline but appear shrunken, elongated and dried up, not unlike that seen in mummification necrosis. The blood vessels in the immediate vicinity of the field of operation are thrombosed.

In the tissues subjected to coagulation, there is a complete loss of cell outline. The neoplastic tissue elements seem to have fused together into a structureless, homogeneous mass. The blood vessels and lymph channels are thrombosed. The secondary and associated changes in all such lesions are regeneration and fibrosis.

In the opinion of the author, basing his opinion upon years of experience, neoplastic diseases of the oral cavity are not necessarily hopeless, and the method of treatment for these local lesions, that holds first place in his estimation, is the electrothermic method. Operative surgery may be employed for the ligation of blood vessels, or to expose a growth in some obscure position. The use of radium and the x ray may be used to control metastasis to the cervical lymph glands.

Pathologic Basis for Roentgen Ray Treatment of Tonsil Disease. W. WARNER WATKINS, M. D., J. A. M. A., 83:1305-1308, October 25, 1924.

IN the course of the discussion, the following points are emphasized:

1. The tonsil is an important organ and should be conserved when possible, through the adolescent period. The tonsils guard the gateway to the respiratory tract and furnish the first protection to bacterial invasion.

2. Irradiation of the tonsil has a known and well established effect on the essential tonsillar tissue.

3. Irradiation of the tonsil can be applied effectively, accurately and with safety to the tonsil.

4. When the pathologic changes are of the hyperplastic type, in which atrophy of the tonsil and re-establishment of the drainage is the consummation to be desired, irradiation is indicated.

5. When irremedial damage has been done to the tonsil, or when atrophy and re-establishment of the drainage is apparently not to be expected, irradiation is not the treatment indicated, but surgery, if clinical conditions call for radical treatment.

The Importance of Radiography in Orthodontia. CHARLES R. BAKER, D. D. S., Internat. Jour. Orthodontia, 10:566-578.

THE author considers the use of the roentgen ray an absolute necessity in the practice of orthodontia, both as an essential aid in the diagnosis and for use in noting the progress of the treatment and the development of the teeth themselves. Full mouth radiograms should be made in every case regardless of the age of the patient, and whether or not all of the permanent teeth are present in the dental arches.

Accompanying the discussion are numerous illustrations to magnify and corroborate his statements.

The Influence of Radiations from Radium Emanation upon Tumor Susceptibility in Albino Rats. KANEMATSU SUGUIRA, from the Huntington Fund for Cancer Research, Memorial Hospital, and the Harrison Research Laboratory, Roosevelt Hospital, New York., J. Cancer Research, 8:376-384, October, 1924.

THE results of experiments designed to observe what influence the radiations from radium emanation might have on the development of transplanted tumors in suckling albino rats, are herein presented. An apparatus was used whereby the rat could be kept at a fixed distance from the small capillary tube containing the radium emanation, for a definite period of time. In this work single doses of radium emanation were used instead of the divided doses.

The growth of the Flexner-Jobling rat carcinoma in untreated suckling rats was compared with the growth in similar animals after irradiation with radium emanation. A total of 143 untreated animals and of 337 irradiated animals was studied. As a result of the work, the author concludes that preliminary irradiation of suckling rats with radium emanation is practically without influence upon the susceptibility of these animals to Flexner-Jobling rat carcinoma. There are, however, indications that the suberythema doses or mild radiations confer a slight immunity, while larger doses have the opposite effect. Such action, if it exists at all, is so slight that experiments with several thousand animals would probably be necessary to definitely settle the question involved.

Aneurism of the Splenic Artery. E. A. Baumgartner, M. D., & W. S. Thomas, M. D., Clifton Springs, N. Y., Surg. Gyn. & Obs., 39:462-471, October, 1924.

WITH the symptoms of abdominal pain, gastro-intestinal haemorrhages, splenic and epigastric tumors, and x ray studies ruling out tumors of the stomach, *aneurism* of the splenic artery should be considered and operation advised; for in operation lies the only hope of recovery in these cases.

International Clinics. A Quarterly of Illustrated Lectures and Especially Prepared Original Articles. Vol. III. Thirty-Fourth Series, 1924. Octavo, 304 pp. and 56 illus. J. B. Lippincott Company, Washington Square Press, Philadelphia and London. Price, $2.50.

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